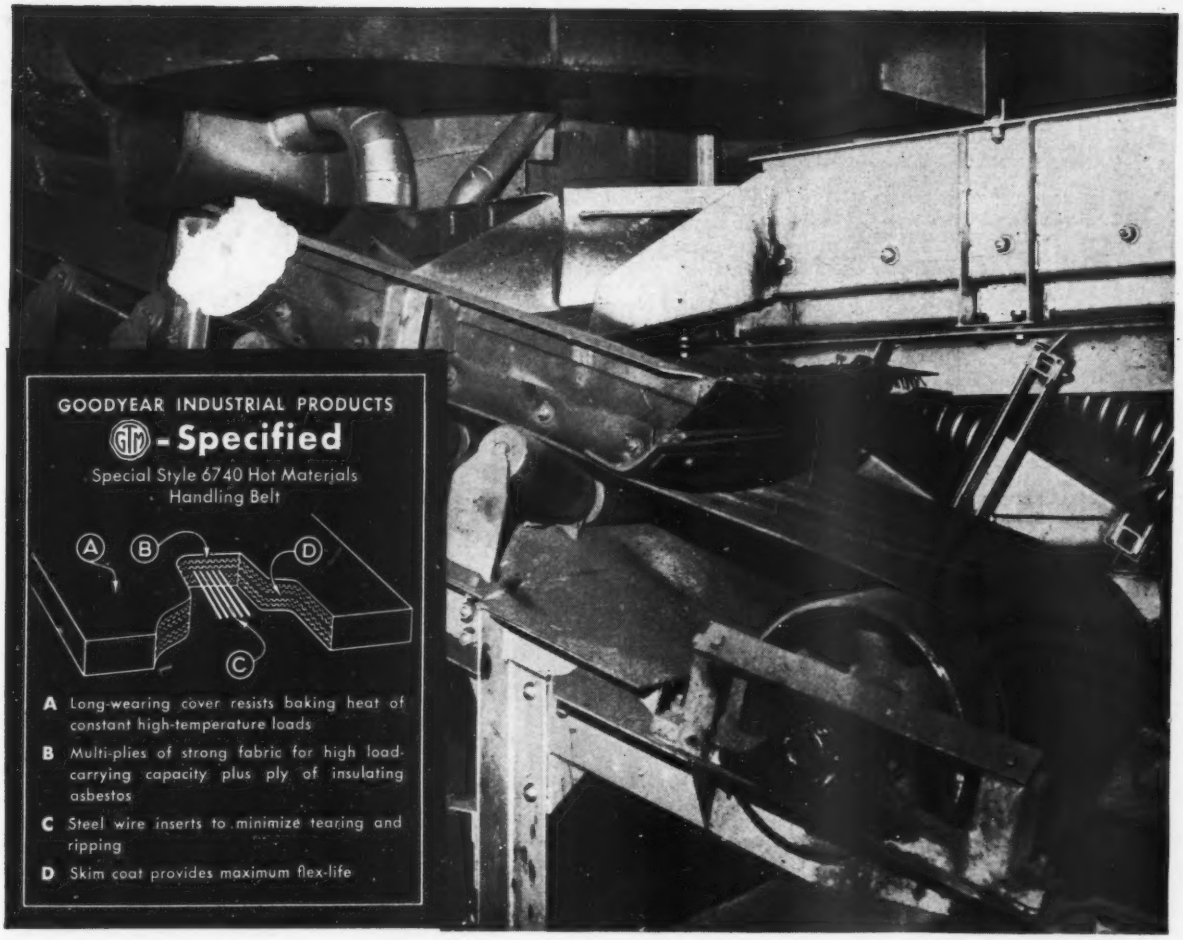
GOODYEAR INDUSTRIAL PRODUCTS
G.T.M. - Specified
Special Style 6740 Hot Materials Handling Belt
A
B
C
D
A Long-wearing cover resists baking heat of constant high-temperature loads
B Multi-plies of strong fabric for high load-carrying capacity plus ply of insulating asbestos
C Steel wire inserts to minimize tearing and ripping
D Skim coat provides maximum flex-life

# G.T.M. Saves $4000/year on shake-out refuse belts

SHARP, hot shot, gates, risers and other scrap quickly tore and burned up refuse-handling belts at this automotive foundry. On the average, the 126′ belts only lasted two months. Usually large patches had to be put in the belt to get even two months' service.

Special, wire-inserted belts (see blueprint) and vulcanized, rather than steel-plate, splices were suggested by the G.T.M.—Goodyear Technical Man. Result: *Service averages six months with $4000 annual savings.*

Your belt or other industrial rubber problems may be similarly solved by the G.T.M. and your Goodyear Distributor. Call them, today! Or write Goodyear, Industrial Products Division, Akron 16, Ohio.

**STYLE 6740 CONVEYOR BELTS by**

**GOODYEAR**

**THE GREATEST NAME IN RUBBER**

**IT'S SMART TO DO BUSINESS** *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

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# 'ROUND ABOUT with the editors in field and office

*Edited by R. L. Marinello*

## Visit Us at Booth 302

EVEN BEFORE you start walking through the aisles at the Plant Maintenance and Engineering Show, why not stop in at the PLANT ENGINEERING booth, which is near the entrance, for a chat with the editors.

This year, the Plant Maintenance and Engineering Show and Conference will be held in the Cleveland Auditorium, Cleveland, Ohio, from January 28 through the 31st.

Or, if you are inclined to take in part of the show first and then rest, you are certainly welcome to stop in the booth any time of day.

## Correspondence Course On Welding

Now, IT IS possible to learn the fundamentals of welding by correspondence. "Welding Fundamental Principles and Practices" is the title of this correspondence course.

The course includes welding methods, procedure control, distortion control, weldability, welding metallurgy, design, inspection, materials and equipment, estimating and costs and economies.

It is divided into 16 lessons and takes about 10 months to complete. Throughout the course exercises are required to be completed and returned for grading. Progress is thereby observed and remedial instruction given.

At the conclusion of the 16 lessons, written examinations will be held at convenient centers under the supervision of a member of a local engineering society or educational institution. This ensures that a high standard is maintained for the awarding of a certificate of completion.

More information about this course may be obtained by writing to R. E. Taylor, Director of National Technical Training Services, 260 Delaware Ave., Buffalo 2, New York.

## McLeod Appointed Plant Engineer

**Robert E. McLeod** was recently appointed plant engineer of the Refractories Division of The Carborundum Co. He succeeds **John S. Gaynor**, who will take on the new duties of Manager of Manufacturing Engineering.

McLeod joined the staff of the Perth Amboy plant in August, 1955 as a project engineer. Before that he was associated with the Newark office of P. Ballantine & Sons as a project engineer and Todd Shipyards in New York City where he was assistant to the general superintendent.

## Instrument Short Course

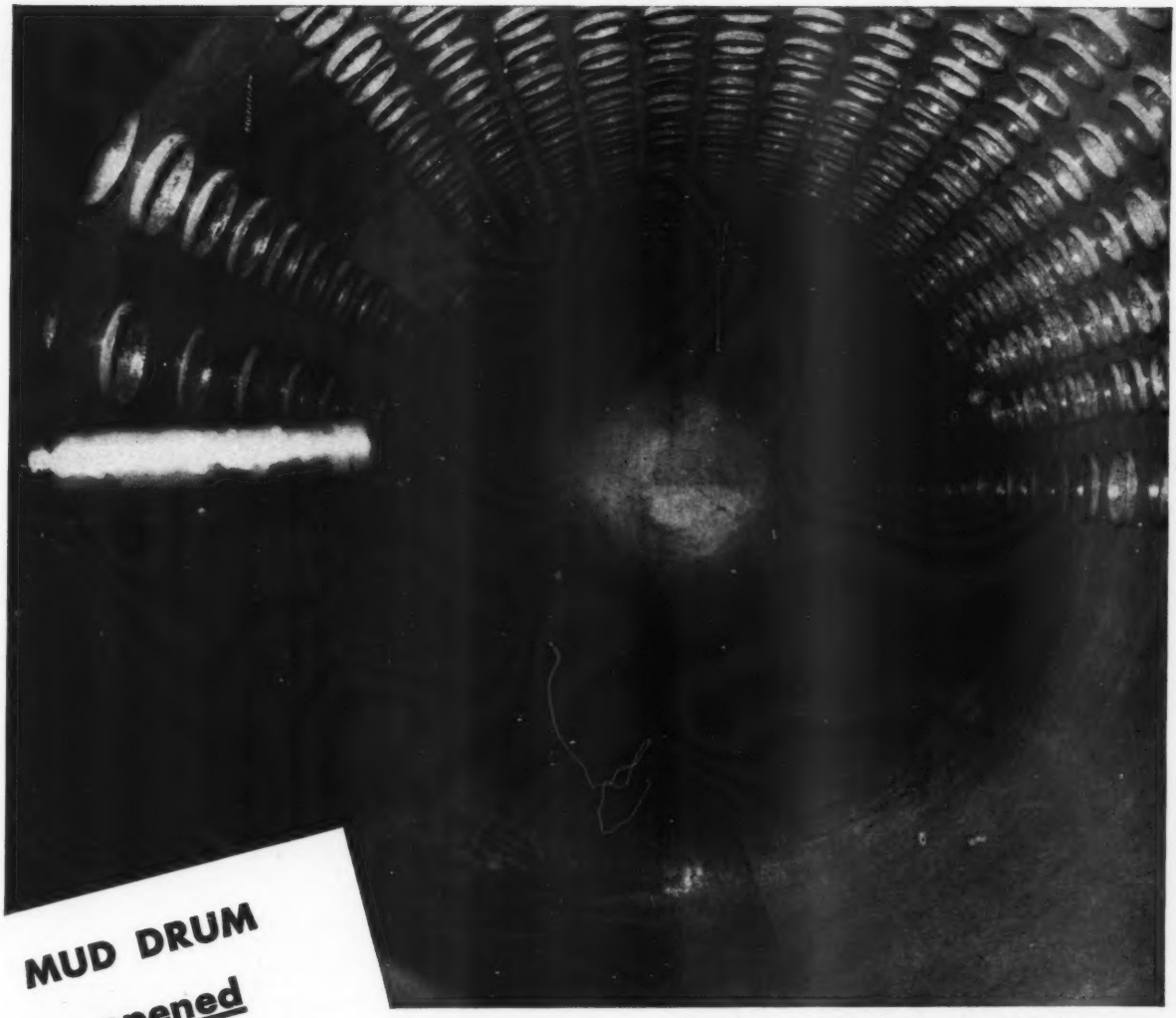
SIXTH ANNUAL Instrument Short Course will be held Thursday and Friday, January 31st and February 1st, 1957, at the Los Angeles Harbor Junior College, Wilmington, California.

The short course covers all three phases of instrumentation. 1. A technical paper will cover basic fundamentals, measurement, application problems and advance techniques of both pneumatic and electronic instruments as applied to flow, temperature and pressure regulation. 2. Practical methods, which is for the training of engineers and technicians in the

## Wanted—Electrical Engineer

PLANT ENGINEERING needs an experienced electrical engineer on its editorial staff. The man we want must be a graduate electrical engineer experienced in industrial electrical maintenance and plant electrical system layout and planning. Experience in selecting electrical equipment and apparatus for in-plant use would be helpful. Age in the neighborhood of 30 to 40. Applicant should be able to write clearly and think logically, like to travel and meet people. If you would like to discuss this interesting job opportunity, send a resumé of experience and photo to: Tom Hanson, Editor PLANT ENGINEERING, 110 South Dearborn St., Chicago 3, Ill.

***Subscriptions: U.S.A. $10, Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by 15th of month to make the change effective with following month's issue. Published monthly and accepted as controlled circulation publication at Chicago, Ill.***



**MUD DRUM as opened after one year on line with THE *Nalco* SYSTEM**

*Unretouched photo of Nalco treated boiler at Georgia Institute of Technology, Atlanta, Georgia*

● Calling this a mud drum serves only to identify its location . . . it is perfectly clean after a full year on line. The unretouched photo was taken immediately after the drum was opened. No wash-out was necessary. Not only is the drum free of scale and corrosion . . . Nalco sludge conditioning operated so effectively that even under the static, off-line draining condition, no sludge deposited in tubes or drums.

The Nalco System can get results like these, economically, in *your* plant—regardless of boiler size or pressure. Write or phone Nalco today for action on a complete water treatment program.

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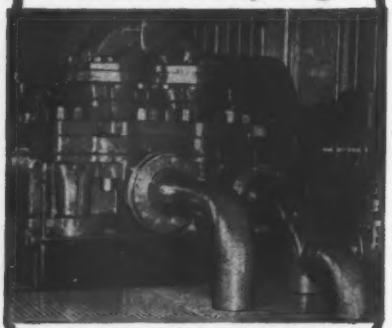
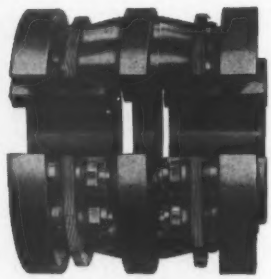
**THE *Nalco*® SYSTEM . . . Serving Industry through Practical Applied Science**

**PROTECT YOUR PUMPS with THOMAS Flexible Couplings**



One Chemical Engineer reports he formerly spent 95% of his time supervising repacking of pump glands. Then he installed Thomas Flexible Couplings. Now his pumps need no attention.



**Only THOMAS Flexible Couplings offer:**

**UNDER LOAD and MISALIGNMENT**

1. No Cross-pull on Bearings or Gland.
2. No End-thrust on Bearings or Impeller.
3. Freedom from Backlash—Torsional Rigidity
4. Free End Float
5. Smooth Continuous Drive with Constant Rotational Velocity
6. Visual Inspection in Operation
7. Original Balance for Life—*and*

**THOMAS ALL-METAL COUPLINGS HAVE NO WEARING PARTS SO THEY REQUIRE NO LUBRICATION AND NO MAINTENANCE**

*Write for Catalog 51A*

**THOMAS FLEXIBLE COUPLING CO.**

**WARREN, PENNSYLVANIA, U.S.A.**

**For more facts circle 504 on Reply Card**


# 'ROUND ABOUT

maintenance and calibration of instruments and control devices. 3. Exhibits, which provide the attendees an opportunity to examine the products of manufacturers of pneumatic and electronic instruments.

More information about this two-day instrument course may be obtained by writing to Thomas H. Ponton, Chairman, Sixth Annual Short Course Publicity Committee, Southern California Meter Association, 640 Fillmore St., Fillmore, California.

## Fred Torn To Head New Section

**Fred Torn** has been named head of the new Plant Engineering Section which has been established at the Los Angeles plant of American Potash & Chemical Corp.

This new department will be responsible for the design of new plant equipment and facilities. It also will work on improving existing processes and will make economic studies in connection with plant production.

## Laboratory Facilities Available

FACILITIES OF THE Factory Mutual Laboratories are now being made available on a contract basis to organizations seeking help in product development or other research.

Present-day facilities afford unusual opportunities not only to investigate fire and explosion phenomena but also to undertake development in other fields, particularly in hydraulics, heat transmission, combustion processes and auto-oxidation.

Here is just a brief listing of the many projects they have conducted or are conducting: fire tests of conveyor belts; water spray distribution analysis; cause of steel plate fracture; dynamic breaking strength of glass; effect of high velocity impact and friction loss tests in fire hose.

Anyone interested in knowing more about the available facilities and would like to have a copy of their descriptive booklet, "Research and Testing," should write to Factory Mutual Laboratories, P. O. Box 510, Norwood, Massachusetts.

## Glossary of Electric Terms

ELECTRICAL TERMS in common use in industry have been compiled into a handy booklet called Glossary of Electric Terms.

This glossary was prepared primarily to serve as a guide for laymen and utility personnel in the preparation and general interpretation of electric utility industry statistics.

Practical definitions are given for over 300 terms, and in addition, many others are indexed and defined by cross-reference. Single copies of the glossary are priced at 50 cents and can be obtained by writing to Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y.

## New Plant Engineering Institute in Oslo, Norway

PLANT ENGINEERING:

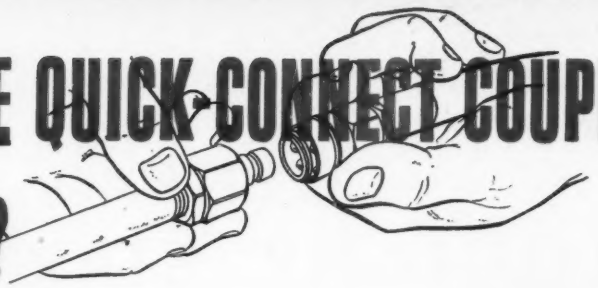
"Industrial plants in the Scandinavian countries have made enormous progress since the last war. Norway and Denmark have received large amounts of American aid and have used the money mainly to build new industrial plants.

"In order to make the new plants as modern as possible, Norway sent a number of engineers to the United States to study American plant engineering methods and many American plant engineers came to Norway as advisers.

"To centralize all these plant engineering studies, the Plant Engineering Institute of Norway was recently established. The picture shows the new institute's building, which is located on the campus of the University of Norway, in Oslo." *Albert Brock-Utne, Chicago, Illinois.*

**Research of plant engineering methods and studies of Scandinavian and American practices are centralized in this new Plant Engineering Institute in Norway**

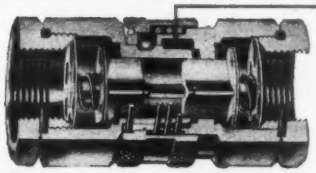
# WHICH SNAP-TITE QUICK-CONNECT COUPLING IS BEST FOR YOU?



## SNAP-TITE "H" COUPLING . . . . . FOR HIGH PRESSURE APPLICATIONS

**FOR HYDRAULIC OR AIR**

"H" Coupling for high strength, higher efficiency, high-resistance to heavy line surge. Sizes: ⅛" thru 12". Bulletin No. 240

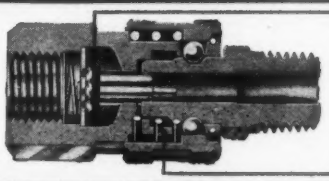


Exclusive U-packer gives a positive seal without compression set because of rubber distortion. Line pressure inside the U-packer keeps it open and forced against its metal backing—the higher the pressure, the tighter the seal.

## SNAP-TITE HI-FLOW COUPLING . . . FOR LOW PRESSURE APPLICATIONS

**FOR AIR AND FLUIDS UP TO 150 p.s.i.**

Hi-Flow is recommended to connect small air tools to plant air system, and for low pressure fluid transfer in small lines. Sizes: ⅛" thru ¾". Bulletin No. 230

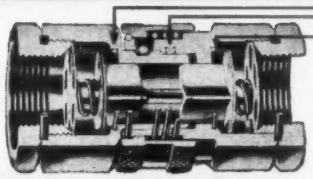


Bonded valve washer
(pat. pending on valve construction)

Exclusive U-packer

## SNAP-TITE "HK" COUPLING . . . . . FOR HARD TO HANDLE FLUIDS

**FOR FUMING ACIDS, ALKALIES, SOLVENTS, AND HIGH PRESSURE STEAM . . .** "HK" is the only coupling now on the market for fluid temperatures from —100° F to +500° F . . . and for live steam up to 460° F. Its seals are made of Teflon for which there is no known solvent. Sizes: ½" thru 3". Bulletin No. 270



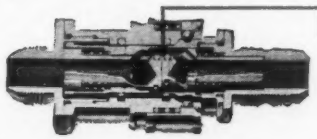
Teflon Valve Seal

Teflon Nipple Seal

Teflon Valve Seal

## SNAP-TITE NO-SPILL COUPLING . . . FOR MINIMUM AIR INCLUSION

**FOR AIRCRAFT, MISSILE HYDRAULIC, FUEL SYSTEMS** which cannot stand air in the lines, and for transmitting fluids which *must not spill*, the Snap-Tite no-spill coupling is recommended. Bulletin No. 280

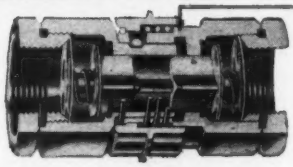


Flush valves prevent spillage, air inclusion. Snap-Tite will engineer special variations to your requirements.

## SNAP-TITE "E" COUPLING . . . . . FOR VACUUM and VERY LOW PRESSURE

**FOR VACUUM SYSTEMS IN THE MICRON RANGE**

"E" Coupling performs in the *micron* range in the smaller sizes both connected and disconnected. Recommended, too, for gravity flow . . . U.L. approved for LP Gas. Sizes: ⅛" thru 12". Bulletin No. 250



Nipple seals in coupler by depressing the lip of the E packer and slightly compressing the body of the packer. This new E-packer gives positive seal under high-pressure, low-pressure, and vacuum.

Snap-Tite Couplings are available plain, (without valves), and with either single or double shut-off. Couplings normally furnished in alloy steel, but all (except hi-flow) are also available in brass, aluminum, or stainless steel with a variety of finishes.

**SNAP-TITE, INC., UNION CITY 5, PA.**

Snap-Tite

**SNAP-TITE COUPLINGS CAN HANDLE ALMOST ANYTHING THAT FLOWS**

*See us at Booth 1721 at the Plant Maintenance Show.*

**For more facts circle 505 on Reply Card**



**For more facts circle 506 on Reply Card** →

# NOW GENERAL ELECTRIC LIMITAMP* STARTERS OFFER EXTRA SPACE SAVINGS BY ELIMINATING FUSE CABINET

General Electric Limitamp starters now offer you greater savings of valuable floor space . . . savings made possible by eliminating the need for an extra fuse cabinet. Previously, starters controlling high-horsepower motors required *six* double-banks of fuses, making necessary an extra fuse cabinet.

Now, through use of higher-capacity Type EJ-2 fuses, G-E Limitamp starters of this type will be delivered to you with *three* double-banks of fuses, thereby eliminating need for the extra cabinet. This single new feature of G.E.'s high-voltage motor control saves over five square feet of space.

## HERE ARE MORE FEATURES ONLY LIMITAMP CONTROL OFFERS

Savings of floor space is but one benefit of General Electric Limitamp control. There are many more. For instance:

- easy installation and connection, made possible with roll-out contactor unit and centrally located bus compartment
- increased personnel safety, provided by three-phase disconnect switch
- flexible arrangement of units and added space savings, with all connections made from front
- complete range of modifications to meet any installation requirement

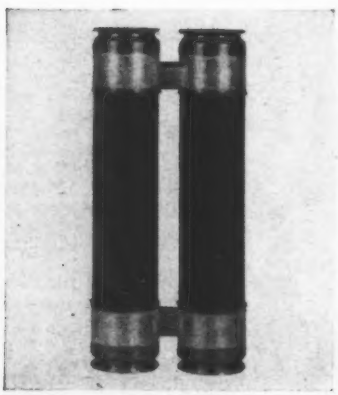
*Reg. Trade-mark of General Electric Company

## TAKE ADVANTAGE OF THESE BENEFITS NOW

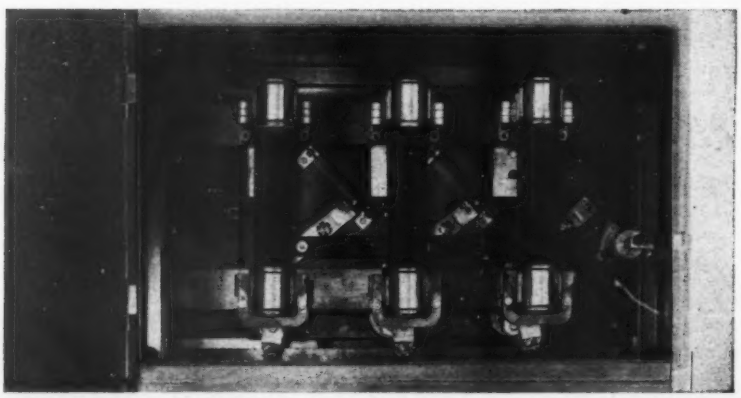
Don't be satisfied with "old-fashioned" high-voltage motor control: Specify General Electric's Limitamp control—*leader in design and performance.* Contact your G-E Apparatus Sales representative today, or write Section 783-1, General Electric Company, Schenectady, New York. *Industry Control Dept., Roanoke, Virginia.*

*Progress Is Our Most Important Product*

GENERAL ELECTRIC



**HIGHER CAPACITY** of EJ-2 fuses eliminates need for extra fuse cabinet.

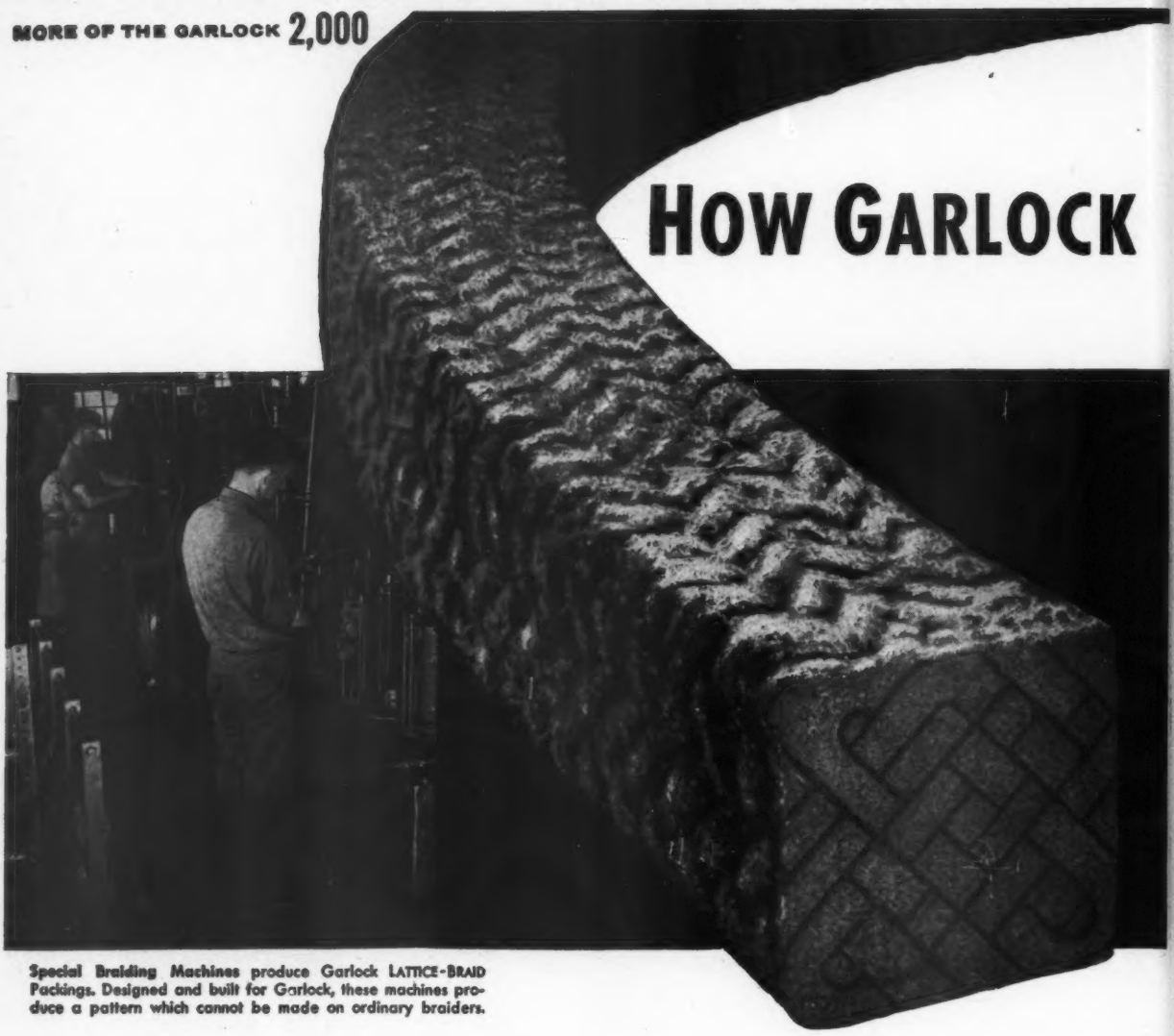


**ONLY HALF AS MANY FUSES**—three double banks—are now used in the General Electric Limitamp starters controlling motors of 700 horsepower and above.

LEADER IN DESIGN AND PERFORMANCE

MORE OF THE GARLOCK **2,000**

# HOW GARLOCK



**Special Braiding Machines** produce Garlock LATTICE-BRAID Packings. Designed and built for Garlock, these machines produce a pattern which cannot be made on ordinary braiders.

## Users Report:

**Chemical Industry**

Centrifugal dye pumps required repacking every 24 to 48 hours. Changed to LATTICE BRAID asbestos packing with Teflon impregnation. Results: minimum of 3 month's service.

**Food Industry**

LATTICE-BRAID blue asbestos packing, Garlock 5880 in constant use 24 hours a day on centrifugal prune pulp pump and still in service after 8 months.

**Metalworking Industry**

LATTICE-BRAID flax outlasts ordinary braided flax three to four times on accumulators, hydraulic rams, lifts, etc. . . . does not break up and rams show less wear.

**Oil Industry**

Centrifugal transfer pump alternately handling caustics, lime, acid and solvents at temperatures to 200° F. was repacked twice a week . . . shaft replaced twice a year. LATTICE-BRAID has given 10 months continuous service . . . saving over $100. already in materials alone.

# LATTICE-BRAID* PACKINGS DIFFER

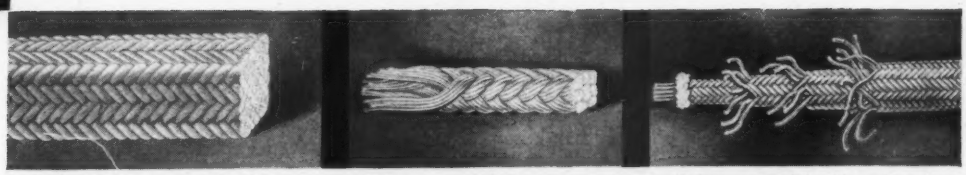
## *from Ordinary Braided Packing*

The Garlock LATTICE-BRAID Packing is distinctly different . . . the result of many years of development and experimental work.

Special machines are required to manufacture the LATTICE-BRAID structure. And the superiority of LATTICE-BRAID packings is due to the unique braiding pattern which cannot be duplicated on ordinary braiding machines.

**ADVANTAGES:** unified structure gives greater strength; no disintegration; less gland adjustment; unusual flexibility.

**Registered Trade Mark*



**Garlock LATTICE-BRAID.** Every strand passes diagonally through body of packing at approximately 45° angle producing completely unified structure. Every strand contributes to strength of entire mass.

**Ordinary square braid.** Each strand merely passes over and under other strands. No strand passes entirely through packing. No common linkage . . . no unified structure, less strength.

**Ordinary round braid** packing is built-up to size by braiding one or more covers over a solid core. No unified structure—when outside covers wear through, packing is no longer serviceable.

LATTICE-BRAID is another important part of "the Garlock 2,000"...two thousand different styles of packings, gaskets, and seals to meet all your needs—the *only* complete line. That's why you get *unbiased* recommendations from your Garlock representative. Call him today or write for LATTICE-BRAID Folder AD-131.

**THE GARLOCK PACKING COMPANY, Palmyra, New York**

**For Prompt Service,** contact one of our 30 sales offices and warehouses throughout the U.S. and Canada.

GARLOCK

*Packings, Gaskets, Oil Seals, Mechanical Seals, Rubber Expansion Joints*

**For more facts circle 507 on Reply Card**

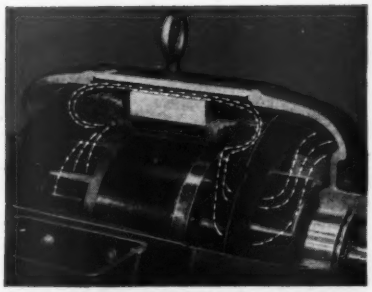
# NEW ROBBINS "SERIES 254U" RE-RATED FIVE BIG

**FULL HEIGHT END HEAD PROTECTION**
One piece shrouded end heads give full height protection against moisture and falling objects. Internal baffles complete splash-proof construction.

# & MYERS

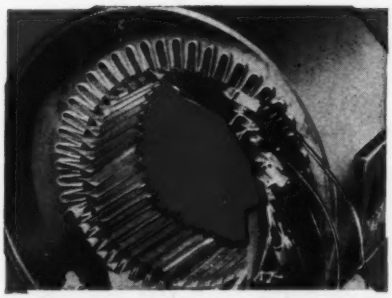
# MOTORS offer you...

# ADVANTAGES!



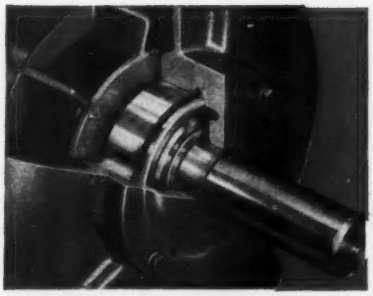
**"STRAIGHT THROUGH" DUAL-SWEEP VENTILATION ELIMINATES "HOT SPOTS"**

Tandem fans, one pushing and the other pulling, produce washing action around and over field coil ends, insure lower internal temperatures and longer dependable operation.



**MYLAR* INSULATION INCREASES MOTOR LIFE.** Mylar*, laminated to rag paper insures positive insulation and assures virtually permanent protection because of its excellent dielectric qualities. In addition, the rag paper backing provides a cushioning effect for added resistance to abrasions and punctures.

*DuPont registered trademark.

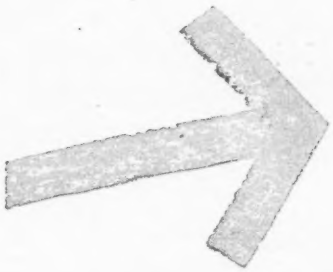


**BEARINGS EASILY INSPECTED**

Removable cover plate at each end of head permits easy bearing inspection without dismantling motor. Bearings run in double-width races, thus have extra-large reservoirs containing grease selected to resist dust, temperature, humidity and high operating speeds.

**PERMANENTLY NUMBERED LEADS SIMPLIFY INSTALLATION AND MAINTENANCE**

Proper lead identification is assured even after years of exposure. Numbers are permanently impregnated into the sub-surface of the insulation . . . can't wear off or deteriorate.

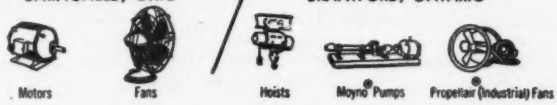


THESE five big advantages make R&M's "Series 254U" re-rated motors your best buy for applications requiring dependable, full-time performance. They can be installed in any environment, outdoors without a cover or in damp and corrosive atmospheres. Moisture, rust or corrosion can't affect their operation, and they take rugged duty in stride! Every R&M motor is electrically and mechanically designed to withstand the most severe operating conditions. Careful quality control and precision manufacture insure top performance and dependability year after year. Write today, for R&M Bulletin 520 PEon R&M's "Series 254U" re-rated motors!

R&M

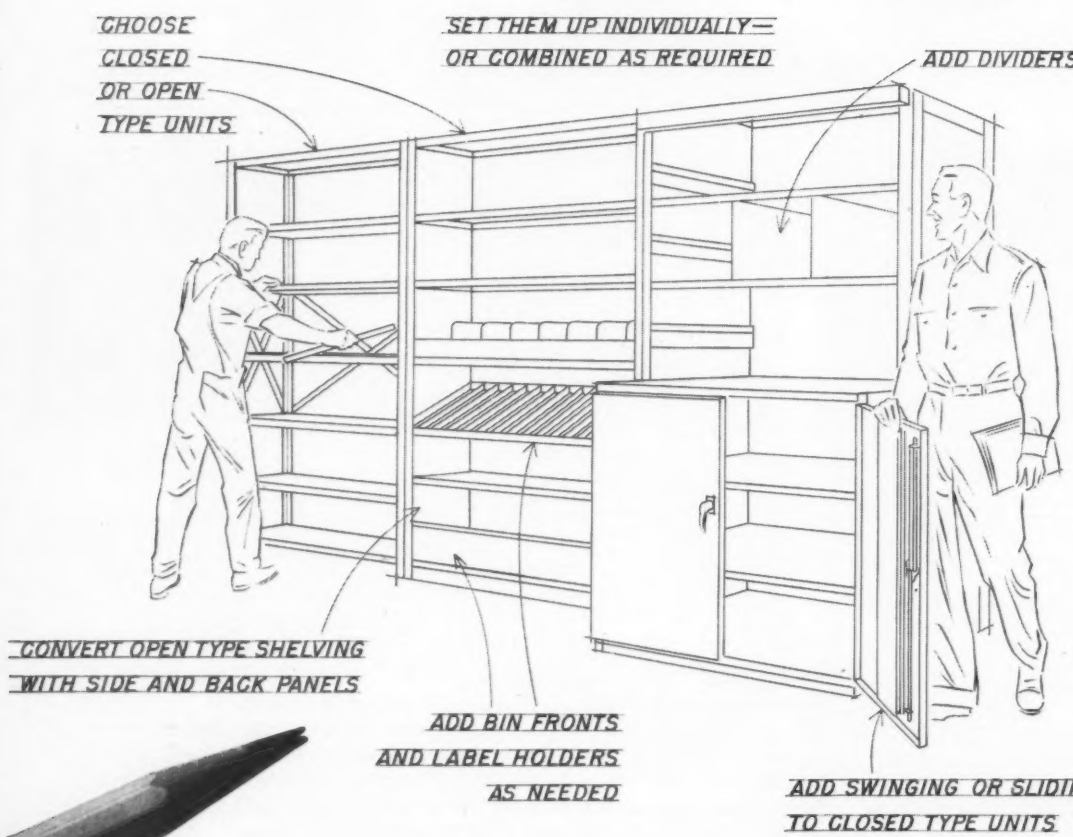
**ROBBINS & MYERS, INC.**

SPRINGFIELD, OHIO | BRANTFORD, ONTARIO



Motors | Fans | Hoists | Moyno® Pumps | Propeller (Industrial) Fans

# HOW TO USE HALLOWELL ADJUSTABLE SHELVING IN PLANT MODERNIZATION


CHOOSE CLOSED OR OPEN TYPE UNITS
SET THEM UP INDIVIDUALLY— OR COMBINED AS REQUIRED
ADD DIVIDERS
CONVERT OPEN TYPE SHELVING WITH SIDE AND BACK PANELS
ADD BIN FRONTS AND LABEL HOLDERS AS NEEDED
ADD SWINGING OR SLIDING DOORS TO CLOSED TYPE UNITS

Baked-on Enamel Finish • Sturdy Steel Construction • Interchangeable Parts Easy to Assemble • Stocked by Leading Shop Equipment Dealers • Send for Bulletin 2057 • Hallowell Shop Equipment Division • Standard Pressed Steel Co., Jenkintown 26, Pa.

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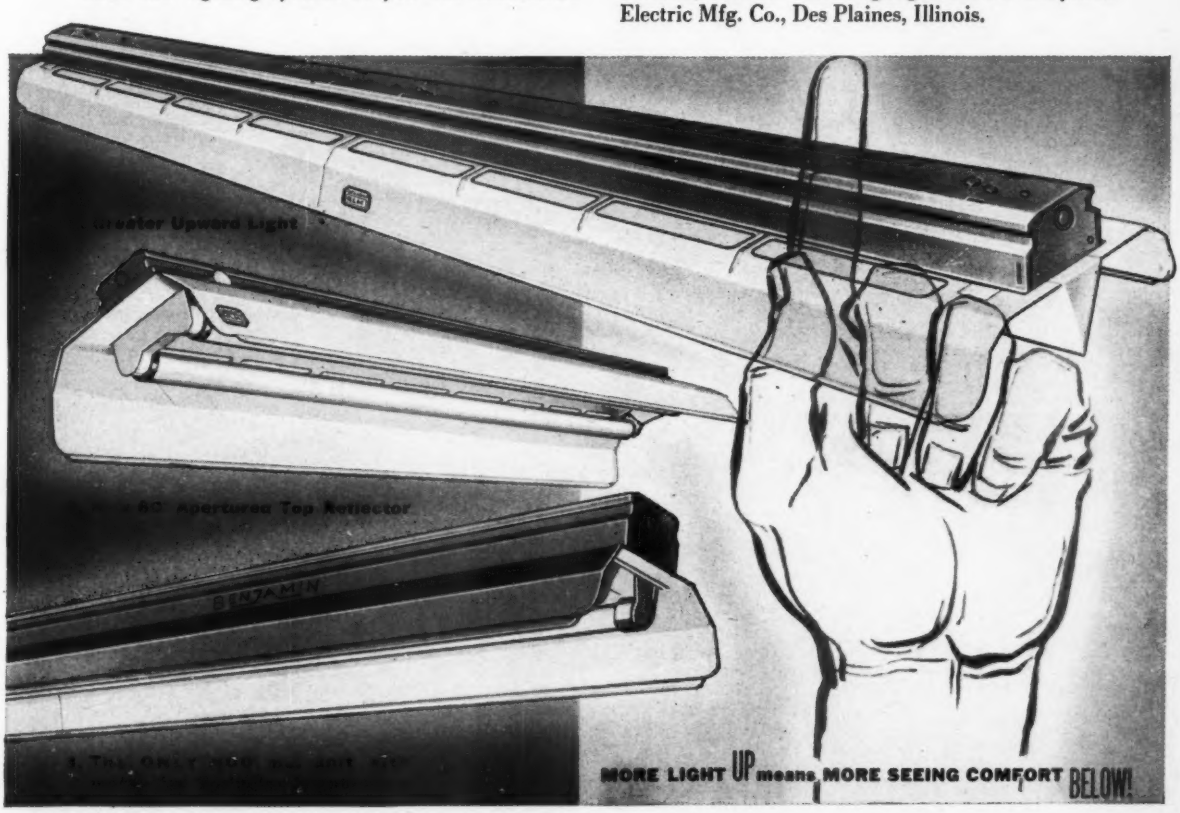
For more facts circle 509 on Reply Card

# Take Complete Advantage of the Latest Advancements in Factory Lighting with these 3 NEW BENJAMIN LIGHTING UNITS

**Greater seeing comfort** through more upward light. More light for the money with new higher-output fluorescent lamps. These are new trends in factory lighting. Trends that can help you get a greater return on your investment in machinery, equipment and personnel. Now, Benjamin offers a choice of three new lighting systems so you can take fullest advantage of these advancements. Each system embodies distinctive Benjamin design and construction features which add to its sustained efficiency and reduce maintenance and operation costs. When you specify Benjamin, you get the most out of the latest factory lighting advancements through outstanding features, such as those highlighted here. Benjamin Electric Mfg. Co., Des Plaines, Illinois.




**1. NEW RLM SD-1 Unit with 25% Upward Light**

Seeing comfort in factories is greatly improved with this new Benjamin Upward Component Unit, certified by RLM. It provides higher quality lighting due to 25% upward light, 27° shielding and special high reflecting white porcelain enamel. In addition, it is the only 25% upward lighting unit with *Springlox* lampholders for easy-in, easy-out lamp replacement, and *Lok-Latch* fasteners for simplified reflector removal. Available for 48″ and 96″ T-12 Slimline, 48″ T-12 40-w Rapid-Start, as well as T-12 800 ma. Rapid-Start* lamps.

**No RLM Standards on 800 ma. units*

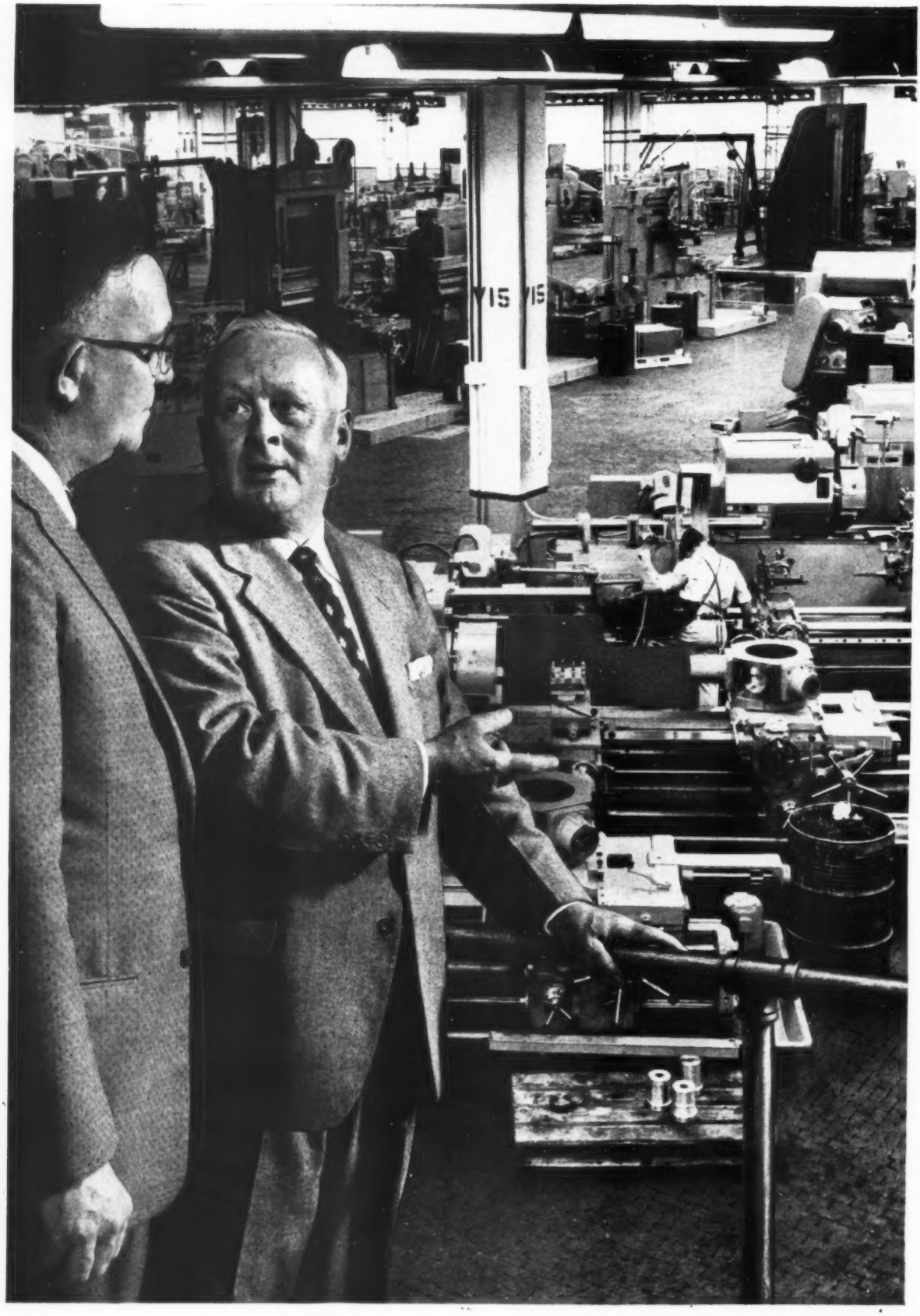
**2. NEW BENJAMIN UNITS FOR 60″ T-17 bi-pin lamps**

Expansion and re-styling of Benjamin's 90/100-w line means that you can now get RLM apertured-top reflectors with 15% uplight—as well as a complete line of open and closed-end porcelain enameled reflectors—in the popular 60″ length. New molded plastic lampholders are mounted in steel housings for extra rigidity. Designed for two 60″ T-17 bi-pin lamps.

**3. NEW BENJAMIN UNITS for HIGHER LIGHT OUTPUT LAMPS**—You get 40% more light from the new 800 ma. fluorescent lamps... and with the new Benjamin units you get even more for your money from these new lamps! "Lifetime" porcelain enameled reflectors with ultra-high reflectivity, deliver the fullest measure of high efficiency offered by these new lamps. Exclusive, metal-clad *Springlox* lampholders provide trouble-free lamp changing and reduction of lamp vibration to make sure you get *all* the extra-long life built into these new fluorescent lamps. A really complete line, too! Individual units or continuous lines; open or closed-end; solid or apertured tops; for two or three 48″ or 96″ 800 ma. Rapid-Start lamps.

*Benjamin Industrial Lighting Equipment is Sold Exclusively Through Electrical Distributors*

**For more facts circle 510 on Reply Card**



*"My boss was stunned when I said . . .*

# 'This plant looks modern . . . but electrically it's obsolete!' "

"About two years ago the plant manager and I were touring the shop areas. We were half way through when I turned and said, 'This plant looks modern . . . but electrically it's obsolete!'

"As plant electrical services engineer, I got his permission to make a study of our plant power distribution system.

"Even I got a big surprise. We found that the power supply wasn't as safe, dependable or flexible as we required . . . and maintenance costs were getting out of hand. A lot of our electric equipment was antiquated and took up valuable production space.

"We had spent so much time improving manufacturing processes and methods that we had neglected electrical needs. Electrically, we were obsolete . . . and not prepared for the big swing to automation.

"Our plant power distribution system has been modernized since then. We've installed more automatic equipment and work-handling devices, and we are ready to apply more advanced types of automation. Our new branch plant is being provided with electrical adequacy, too.

"You can probably do the same thing we did to get greater efficiency." J-96101-1

*Is your plant suffering from electrical growing pains?*

Surveys show that many of the nation's plants are inadequate electrically. A recent study of 42 plants in a given area revealed 88% had electrical problems that interfered with production.

**These Problems Can't Wait**

| | Percent of Plants Inadequate — Electrically* |
|---|---|
| Inadequate transformer capacity and flexibility | 42% |
| Questionable breaker interrupting capacity | 63% |
| Lack of power centers | 62% |
| Poor power factor | 25% |
| No motor control centers | 42% |
| No plug-in bus duct | 32% |
| Low primary distribution voltage (below 4160 volts) | 49% |
| Low secondary voltage (below 480 volts) | 25% |
| Lack of network distribution systems | 90% |
| Lack of automatic switching to maintain continuity | 69% |
| Absence of 277-volt lighting | 94% |

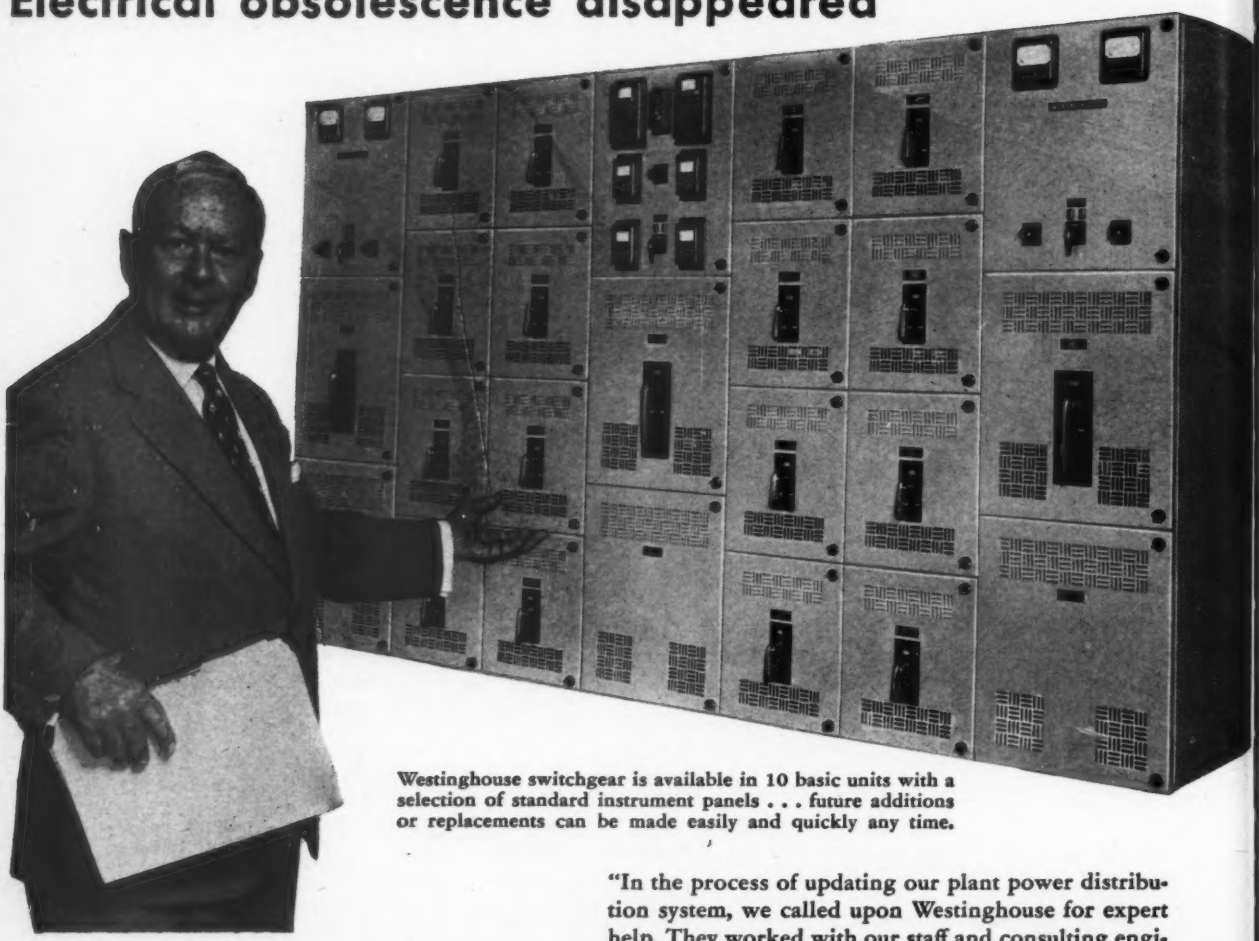
*Based on report of survey in 156 top U.S. plants conducted by *Factory* magazine.

**YOU CAN BE SURE...IF IT'S**

**Westinghouse**

*"I called in Westinghouse . . .*

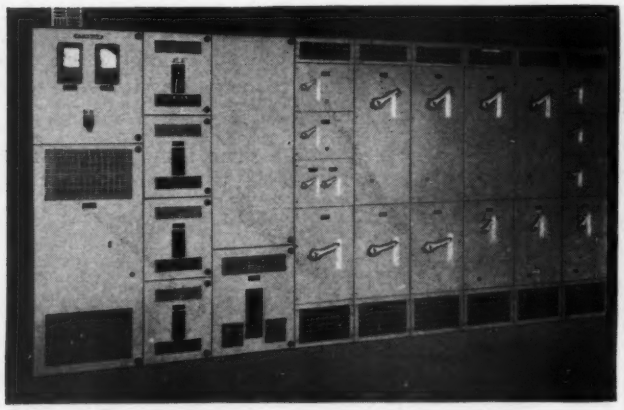
# Electrical obsolescence disappeared"



Westinghouse switchgear is available in 10 basic units with a selection of standard instrument panels . . . future additions or replacements can be made easily and quickly any time.

"In the process of updating our plant power distribution system, we called upon Westinghouse for expert help. They worked with our staff and consulting engineers to give our plant electrical adequacy.

Westinghouse dry-type transformers save space, mount conveniently in out-of-the-way places. Well suited for wet, dirty or hot locations. Placement close to work load saves long, costly secondary runs.



Expansion with Westinghouse control centers frequently saves as much as 40% on installation costs over decentralized methods of mounting motor control. Inspection and service are simplified.

### Switchgear gave us safer, more dependable operation

"We selected Westinghouse low-voltage, metal-enclosed switchgear which gave us high interrupting capacity, assuring safety and operating continuity. It reduced our maintenance, brought economic advantages and freedom to expand our facilities.

"In our new installation, unitized Westinghouse switchgear reduced our special design and engineering expense, and provided custom-built preciseness for our application requirements.

### Capacitors paid for themselves in 18 months

"With Westinghouse guidance, we applied capacitors carefully at the substation bus, on secondary bus duct, and right at the motor loads. Savings on our power bill in the first year amounted to 75% of capacitor installed cost. Capacitors paid for themselves in 18 months, and the savings are still going on.

"The capacitors reduced the burden on our feeders and released electrical capacity for other needs. We got better voltage regulation at our motor and lighting loads.

### Transformer provided convenient power . . . economically

"We wanted to get power close to the load . . . placing Westinghouse transformers strategically throughout our plant did the job conveniently, economically. For high-impulse levels we used oil- and askarel-filled units, while dry types were used when light weight and ease of installation were vital. I learned that a combination of Hipersil® cores and high-temperature insulation in Westinghouse transformers reduces size and weight one third.

Westinghouse capacitors are low in initial cost, require no maintenance, save additional investment in transformer capacity. Solder-sealed porcelain bushings protect against leaks or contamination of dielectric.

### Packaged control simplified system design

"Westinghouse furnished control centers for our permanent machine arrangements. This gave us simplicity in planning and installation, a high degree of safety and flexibility, centralized operation and maintenance.

"Some of our machines were subject to frequent moving. Here we used Westinghouse plug-in bus duct with individual controls at each machine. In both cases, we found that Westinghouse packaged control equipment simplified system design, reduced some costs up to 40%.

### "Why not call Westinghouse . . . like I did?"

"I'm sure you'll find Westinghouse a real lifesaver in helping out with your plant power distribution systems, too. Their engineering team will gladly work with your staff and your consulting engineers. I got our plant on the road to electrical adequacy by getting in touch with my local Westinghouse representative."

For more information, call your local Westinghouse sales office or send coupon. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-96101-2

**YOU CAN BE SURE... IF IT'S**

# Westinghouse

Westinghouse Electric Corporation
3 Gateway Center, P. O. Box 868
Pittsburgh 30, Pa.

☐ I would like a showing of the 20-minute film, *Selecting the Right Industrial Distribution System.*

I'm interested in more information about:

☐ Switchgear ☐ Capacitors

☐ Transformers ☐ Controls

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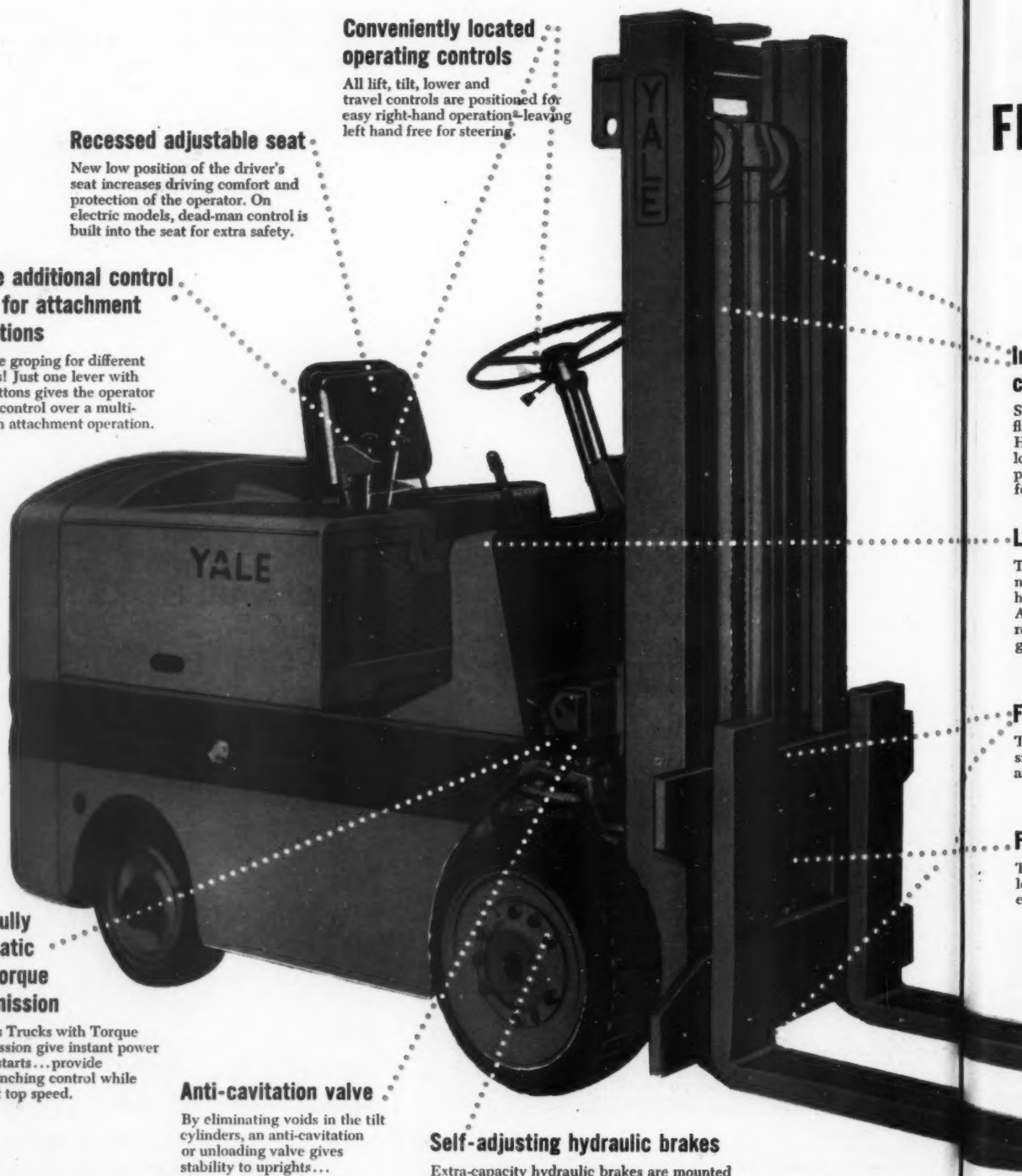
FIRM_____

ADDRESS_____

CITY_____ STATE_____

DETROIT PUBLIC LIBRARY

# 10 PREMIUM




### Conveniently located operating controls

All lift, tilt, lower and travel controls are positioned for easy right-hand operation—leaving left hand free for steering.

### Recessed adjustable seat

New low position of the driver's seat increases driving comfort and protection of the operator. On electric models, dead-man control is built into the seat for extra safety.

### Single additional control lever for attachment operations

No more groping for different controls! Just one lever with pushbuttons gives the operator instant control over a multi-function attachment operation.

### New fully automatic Yale torque transmission

Yale Gas Trucks with Torque Transmission give instant power for fast starts... provide perfect inching control while lifting at top speed.

### Anti-cavitation valve

By eliminating voids in the tilt cylinders, an anti-cavitation or unloading valve gives stability to uprights... eliminates channel sway.

### Self-adjusting hydraulic brakes

Extra-capacity hydraulic brakes are mounted directly to each drive wheel for easier, faster stopping without jolting or load damage.

# ADVANCEMENTS:

## ONLY YALE OFFERS ALL 10 AS STANDARD FEATURES IN A COMPLETE FORK TRUCK LINE

**Improved roller channel construction**

Special rolled channels have thick flange sections for extra long life. Hose take-ups for attachments are located *within* the channels to prevent hose damage and increase forward visibility.

**Lowered cowl**

The new low cowl gives the operator more visibility, yet provides him with adequate protection. All instruments are water-proofed, recessed in the cowl and grouped for easy reading.

**Four side-thrust rollers**

Two side-thrust rollers on either side of the carriage reduce stress and compensate for off-center loading.

**Flow regulator valve**

This valve assures smooth lowering control without excessive speed.

*Now—all the "de luxe" Yale truck power and operating improvements of recent years built in as standard features! This is*

### Yale "Integrated Design"

*—the bold new concept in fork truck engineering that offers every industry today's highest level of truck performance.*

Extensive Yale research and field testing proved—truck performance over the long haul can't be of top efficiency unless the truck is *engineered* for it! The result: Yale "Integrated Design"—the incorporation of premium advances as standard features built into a complete line of trucks that meet all the day-in, day-out demands for power, efficiency, safety, versatility and operator comfort—even under the toughest handling conditions.

This new concept means more economical materials handling—in initial truck investment, in operating costs, in maintenance costs. You get the greatest possible truck value for your materials handling dollar. To extend this value even further, Yale "Integrated Design" Trucks have a high degree of interchangeability of parts. Thus, whether you operate a fleet of gasoline trucks, or gasoline and electric trucks of comparable capacities, you need only a limited spare-part inventory.

To meet the great variety of handling needs of every industry, Yale "Integrated Design" offers you a complete line of fork lift trucks: Gas Trucks in capacities of 2,000 to 10,000 lbs. with Yale Torque Transmission, Fluid Coupling or Standard Transmission; Electric Trucks, equipped with Yale's exclusive Magnetic Cam-O-Tactor Controller, in capacities up to 150,000 lbs. For full facts and specifications, write The Yale & Towne Manufacturing Co., Philadelphia 15, Pa., Dept. 471.

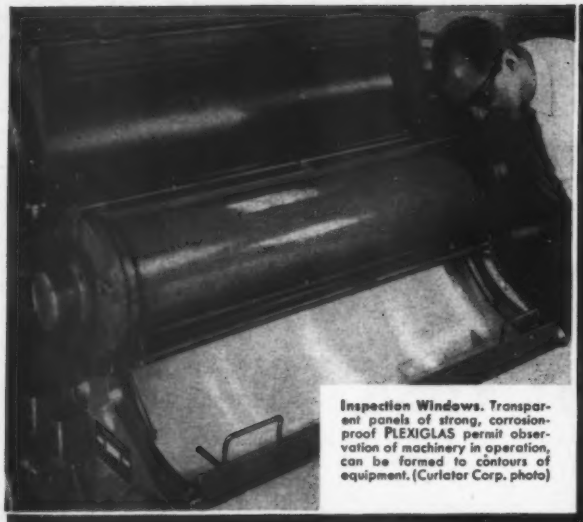
YALE*

**INDUSTRIAL LIFT TRUCKS AND HOISTS**

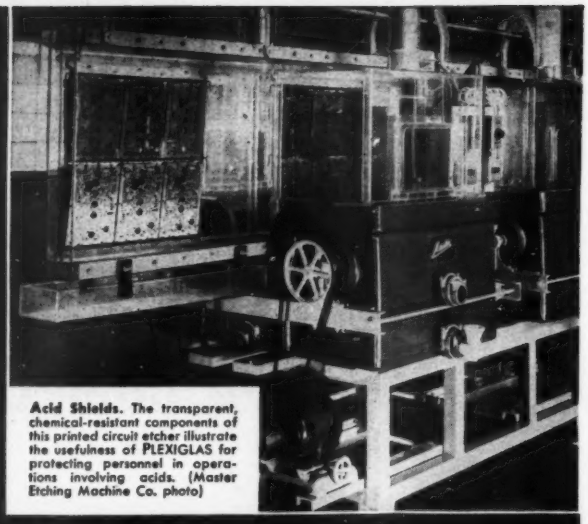
*REG. U. S. PAT. OFF

**Gas, Electric & LP-Gas Industrial Lift Trucks • *Worksavers* • Warehousers • Hand Trucks • Hand and Electric Hoists**

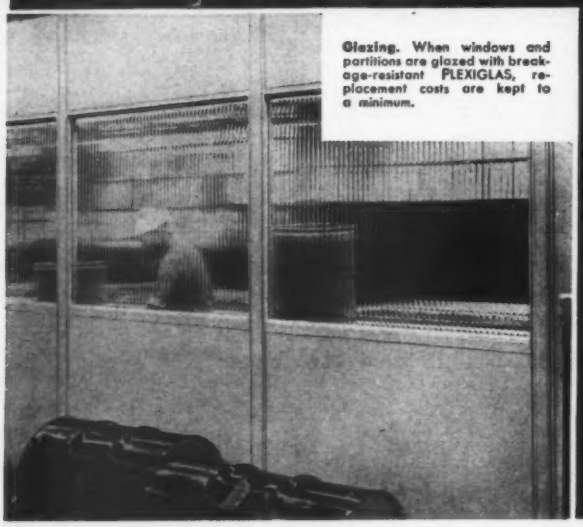
**For more facts circle 512 on Reply Card**



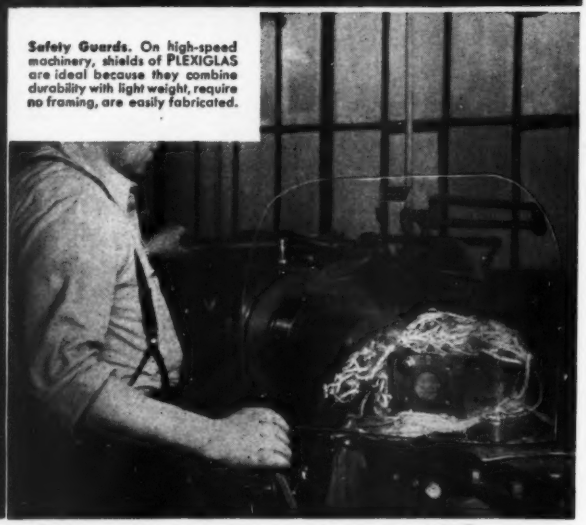
**Inspection Windows.** Transparent panels of strong, corrosion-proof PLEXIGLAS permit observation of machinery in operation, can be formed to contours of equipment. (Curlator Corp. photo)



**Acid Shields.** The transparent, chemical-resistant components of this printed circuit etcher illustrate the usefulness of PLEXIGLAS for protecting personnel in operations involving acids. (Master Etching Machine Co. photo)



**Glazing.** When windows and partitions are glazed with breakage-resistant PLEXIGLAS, replacement costs are kept to a minimum.



**Safety Guards.** On high-speed machinery, shields of PLEXIGLAS are ideal because they combine durability with light weight, require no framing, are easily fabricated.

# Plexiglas—useful in so many ways around the plant

PLEXIGLAS® is a remarkably versatile material. It is used for aircraft enclosures, tail lights on cars, faces and letters of signs, diffusers on lighting fixtures, and dome skylights—to mention just a few of its widely varied fields of application. And in industrial plants, the uses of this acrylic plastic are equally diverse.

Check the typical plant applications shown above, and the properties listed below. The chances are that you will discover one or more ways to use PLEXIGLAS to advantage in *your* plant.

- great strength, light weight and crystal-clear transparency
- resistance to corrosive atmospheres
- excellent electrical properties
- all-weather durability
- formability to almost any shape
- machining characteristics like those of wood or soft metals

PLEXIGLAS R, the lower-cost grade, is especially suitable for industrial plant applications. Call your nearest dealer for information and quick delivery.

Dealers are listed under PLEXIGLAS in the Plastics section of classified telephone directories of most large cities.

*Chemicals for Industry*

**ROHM & HAAS COMPANY**

**WASHINGTON SQUARE, PHILADELPHIA 5, PA.**

*Representatives in principal foreign countries*

**Canadian Distributor:** *Crystal Glass & Plastics Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Canada*

**For more facts circle 513 on Reply Card**

# BULLETINS just released and of immediate plant interest

## CONSTRUCTION

**101 Glass for Construction** — This 28-pp manual outlines uses, qualities and specifications of company's flat glass and Blue Ridge patterned glass products. Contains individual sections dealing with varieties of polished plate glass, window and safety glass, Vitrolite colored structural glass, bent glass, Tuf-flex doors, Mirropane transparent mirrors, bullet resisting glass, and others. In addition to a chart outlining standard and non-standard sizes of Thermopane, the book provides glazing information, standard sizes of sliding doors, metal and wood sash data. Libbey-Owens-Ford Glass Co.

**102 Floor Hardeners**—Five new bulletins, first of a series of 50, are now available to plant engineers. Devoted to hardeners for use in new floor construction, this first set of bulletins includes one on Ferro-Fax, for strengthening concrete floors with metallic topping; Hornolith a liquid floor hardener; Durafax, an abrasive floor hardener; and Ferem, a blue temper component for ultra protection against corrosion and abrasion in cement floors. The fifth bulletin gives general information on all four hardeners. A. C. Horn Co., Inc.

**103 For Building Material**—How to lick industrial corrosion problems and permanently weatherseal building materials is told in this 12-pp reference catalog. Contains data on company's protective coatings and synthetic rubber compound. Explains how the coatings protect metal, masonry and wood against acids, alkalis, alcohol, oils, gasoline, solvents, salts and water; and how metal, masonry and glass are given a weathertight seal. Each product's features, functions, performance and instructions for application are outlined. Booklet is tab indexed for easy reference. David E. Long Corp.

**104 Tubular Steel Scaffolds**—Catalog 62, 12 pp, features various applications of company's tubular steel scaffold as employed for building construction, maintenance and repair. Advantages are detailed and photos of typical applications are included. Beaver-Advance Corp.

**105 Nuts and Bolts** — Structural rib bolts and automatic lock nuts are described in this illustrated bulletin. Advantages in various types of constructions are detailed and typical applications are illustrated. Automatic Nut Co., Inc.

## HEATING, COOLING

**106 Heating, Cooling Equipment**—The 38-pp 1956 Estimating Catalog lists price revisions and describes product improvements for company's air conditioning, ventilation, refrigeration and heating supplies and equipment, and includes complete technical and dimensional data. Most of the engineering data are presented in the form of tables and graphs, profusely illustrated with photos, drawings and diagrams. M. Blazer & Son.

**107 For Steam Heating**—Eight-pp Bulletin 1501A illustrates a line of steam heating specialties. These products include radiator valves, float and thermostatic radiator traps, inverted bucket traps, strainers, air eliminator air checks, and gages, for steam, oil, gas, and water. Specification data provided covers dimensions, weights, and capacities. Dunham-Bush, Inc.

**108 Heating, Cooling Coils**—Detailed information on heating and cooling coils for every heat transfer need is presented in this illustrated 36-pp catalog. Describes direct expansion Freon cooling coils, water coils and steam heating coils, and includes photos, drawings, performance tables, selection graphs, dimensional data, capacity tables, and a psychrometric chart. M. Blazer & Son.

## INSULATION

**110 Duct Insulation Specs** — These printed data sheets are offered to assist in writing of insulation specifications for heating and air conditioning duct systems. Punched for loose-leaf filing, the two data sheets detail approved specifications for attaching and finishing semi-rigid duct insulation. Three methods of attachment and four finishing techniques are described. Specifications for applying plain, vapor barrier and coated duct insulation are included. Baldwin-Hill Co.

**111 Insulation News Briefs**—The September 1956 issue of the Armstrong Insulator features a number of interesting articles on industries and new developments in which manufacturer's insulations are utilized. Among the stories is one on the Table Rock Dam buildling project, another about brewery by-products, and one about cement making. Armstrong Cork Co.

**112 Glass Fiber Insulation**—Among the company's products described in this illustrated bulletin are three kinds of flame-blown glass fiber insulations used for thermal and acoustical applications. Charts are included illustrating the acoustical and thermal values of the insulating blankets. L. O. F. Glass Fibers Co.

**113 Pipe, Block Insulation** — Form A-400 describes Hylo pipe covering and block insulation for high and low temperatures ranging down from 1600 to 100 F. Physical data, uses, application, and sizes are covered, and specifications included. The Eagle-Picher Co.

## VENTILATING AND AIR CONDITIONING

**114 Centrifugal Fans**—Bulletin A-103, 64 pp, describes airfoil centrifugal fans engineered around a backward curved non-overload type centrifugal wheel utilizing a hollow sectioned aerodynamic shaped airfoil blade. Advantages of design are fully detailed, and specifications and performance tables included. Photos of various models, drawings showing standard drive arrangements, charts and tables, and dimensional diagrams complete the picture. Chicago Blower Corp.

**115 Roof Ventilator**—Bulletin 2300 describes three low silhouette sizes in company's line of roof ventilators, ranging in height from 6¾ to 12¾ in. Diagrams showing dimensional details, photos, capacities at various pressures, and specifications are included. Ilg Electric Ventilating Co.

**116 Air Conditioners**—Bulletin 133 describes coil surface type air conditioners for industrial and commercial applications. Photos and diagrams covering units in capacities from 41,500 to 1,680,000 Btu per hr cooling range are included, also specifications. Niagara Blower Co.

## DUST CONTROL

**117 Industrial Dust Control** — Sixteen-pp Bulletin 922, encompassing dust control equipment and accessories, describes importance of dust control in relation to reduced maintenance costs, employee morale, and commercial utilization of dust by-products. Outlines standards of control and efficiency in dust collection and lists primary component parts of an engineered system. A typical case history shows benefits of dust control in handling a community relations problem. Drawings and photos accompany descriptive information on dust control equipment, including new self-cleaning cloth screen collectors, various other types. Pangborn Corp.

**118 Coal Dust Control**—Bulletin 551-D discusses control of dust from coal and coke handling operations. Covers use of local exhaust ventilation and cloth-tube-type dust collectors. Four illustrated case histories are presented. Diagrams of materials handling systems and how dust control is exercised in them are included. Wheelabrator Corp.

**119 Dust Collection**—Bulletin 710 discusses the Dustkop as a modern solution to large and small dust handling problems. Several typical installations are pictured showing how this high efficiency cyclone type collector performs a variety of dust collecting jobs. Aget Mfg. Co.

## ELECTRICAL

**121 Motor Selector**—Bulletin B-2103-1, 12 pp, is a "working tool" for selecting a-c motors for specific applications. Included are such comprehensive selection data as speed-frequency relationship, NEMA design classes, torque characteristics, NEMA current and torque values, frame selection tables, and dimension charts and mechanical modifications for frame sizes 182 to 6085. Reliance Electric and Engineering Co.

**122 Re-Rated Motors**—Form 3470, 8 pp, features re-rated motors with specially treated corrosion resistant steel housing which offers protection against all adverse weather conditions. Component features are described and illustrated, and details of construction and design shown in cutaway views and drawings. Robbins & Myers, Inc.

**123 Protected Motors**—"Total Protection"—a new concept in protected enclosures for industrial a-c motors—is graphically described in Bulletin B-2501. Cutaway views of motor and its components show how it is designed for applications which formerly required drip-proof or splash-proof motors, yet is guaranteed to operate within a maximum temperature rise of 40 C. Reliance Electric and Engineering Co.

**124 Electric Power Drives**—This 20-pp condensed catalog features a complete listing of prices and selection data for the more commonly used electric power drives. Covers normal speed electric motors, geared motors, variable speed transmissions and speed reducers. Tables simplify selection, and diagrams illustrate dimensional details. Sterling Electric Motors, Inc.

**125 Butyl-Molded Transformers** — Bulletin GED-3112, 12 pp, contains photos and information on the nine butyl-molded models which comprise a complete line of current transformers from a 600-v miniature to a 15,000-v outdoor type utilizing Hy-Bute/60 insulation. Construction features are illustrated, results of atmospheric tests recorded, and continuous thermal ratings shown. General Electric Co.

**126 Enclosed Breakers**—Catalog 1-155, 20 pp, describes standardized new types of AB-I enclosed circuit breakers with 600 v ratings ranging from 15 to 600 amp. Text, illustrations and tables supply complete data covering the range of available AB breakers and enclosures, purchasing information, optional accessories and application. Application information, knockout data included. Federal Pacific Electric Co.

**127 Circuit Breaker Protection**—A method of co-ordinating molded case circuit breakers with current-limiting fuses for protecting low-voltage feeder circuits against fault currents up to 100,000 amp (RMS asymmetrical) is described in 8-pp Bulletin GEA-6569. Describes how the method can be employed in planning new systems and in replacing old, inadequate systems where there is a need for high levels of interrupting capacity. Tables showing proper fuses to co-ordinate with standard breakers for applications at high short-circuit duties up to 100,000 amp are included. General Electric Co.

You'll find two postage-free Reader Service Cards on pages 219-220. Use them for ordering these bulletins — just circle the item numbers of those you want. You may also use the cards for requesting advertised catalogs.

# BULLETINS

(Begins on page 21)

**128** **Improved Panelboards**—Sixteen-pp Bulletin 1-160 describes new techniques for more efficient design and installation of industrial and other panelboards. Provides data on plug-in StABreakers and enclosures for lighting and power distribution. Bulletin provides information necessary to selection of components for distribution panelboard, and includes knockout data. Among units shown is an E frame unit rated 15 to 50 amp, capable of doubling the number of lighting circuits available in a distribution panelboard of a given size. Federal Pacific Electric Co.

**129** **Switches For Industry**—Catalog 101C, 20 pp, describes various types of industrial switches from those of postage stamp size to heavy duty limit switches. Characteristics of each type of switch are listed, electrical ratings given, and photos and drawings illustrating operation and design included. Micro Switch, Div. of Minneapolis-Honeywell Regulator Co.

**130** **Switches and Relays**—This 12-pp 1956-1957 catalog shows some 40 switches and relays ranging in size from standard size units to the miniature, and describes the operation and characteristics of each. Also shows new developments in switches and relays and gives complete specifications, size, capacities and other data. Jaidinger Mfg. Co., Inc.

**131** **Enclosed Switches**—Catalog 77, 24 pp, covers twelve different families of precision, snap-action aircraft switches. Complete with photos, dimensional drawings, electrical ratings, and technical information, it includes environment-proof switches, hermetically sealed switches, completely sealed cylindrical switches, high temperature switches, enclosed multi-circuit switches and switches which conform to JAN, AN or MS specifications. Micro Switch, Div. of Minneapolis-Honeywell Regulator Co.

**132** **Non-Metallic Cables**—This 40-pp catalog discusses composition, properties, and suggested applications of company's Type RR rubber-insulated-Neoprene sheathed non-metallic cables. Provides evidence of the "weathering" properties of the cables when exposed to aggressive sun, water and soil conditions. Individual treatment is accorded to 600-v underground service cables, 600-v duct cables, and high voltage cable and station control cable. Charts give data on size, strand construction, insulation sheathing, shipping weights. Current carrying capacities are also given. National Electric Products Corp.

**133** **Electrical Wire, Cable** — Bulletin 1105, Section 1, 16 pp, features a cable selection chart and complete engineering information on company's line of electrical wire and cable. Advantages of the products are detailed, a table of insulations furnished, and design and construction features illustrated. The Okonite Co.

**134** **Solderless Wiring Devices** — Bulletin 856, 8 pp, describes solderless wiring devices designed for easier, faster electrical connections. Complete specification information on various types of terminals and connectors is included. Electric Terminals Corp.

**135** **Insulating Tapes, Fabrics** — Insulating tapes and fabrics facts are fully detailed in loose-leaf Booklet B-1050. The series of bulletins covers varnish and shellac treated papers, organic varnished fabrics and combination insulations, organic varnished glass fabric insulations, Class A and B, silicones varnished and silicone rubber coated insulations, Class H, and special insulations. Covers standard items of varnished papers, cambrics, and glass fabrics, as well as newer materials in Class B and H temperature ranges. Westinghouse Electric Corp.

**136** **High-Voltage Bushings** — Twelve-pp Bulletin 508 describes paper-oil condenser bushings for high-voltage applications. Lists five bushing sizes, 15, 23, 34.5, 46 and 69 kv with complete description of the totally enclosed, paper-oil condenser type construction. Catalog numbers, ratings, dimensions and specifications, as well as photos and line drawings are included. Lapp Insulator Co., Inc.

**137** **High Current Rectifier** — This 12-pp brochure, Publication ECG-148A, contains application notes on the 4JA60 series of small high current silicon rectifiers capable of handling 10-kw in a three-phase bridge circuit. Characteristic curves for power dissipation, instantaneous forward voltage drop, maximum allowable surge current at maximum rated load conditions, and fin size requirements under various ambient conditions for both free convection and forced convection of air furnished. General Electric Co.

## MECHANICAL POWER TRANSMISSION

**139** **QD Sheaves**—Catalog Section 83-A, 16 pp, lists 739 stock sizes of company's QD (quick-detachable) sheaves, which are interchangeable with sheaves produced by other QD manufacturers. Gives dimensions and weights, describes features of standardized QD sheaves and provides instructions for both standard and alternate mounting of sheaves on shafts. Other data include standardized QD hub and keyway dimensions, listing of stock hub bores and keyways, sheave groove dimensions and tolerances and interchangeable hub and sheave combinations. Fort Worth Steel & Machinery Co.

**140** **Stock Sprockets**—Design and operation advantages of the Grip-Master line of stock sprockets, roller chain flexible couplings, hubs and bushings are detailed in 20-pp Catalog 200A. Complete specifications are given in tabulated form, and photos and drawings illustrating important features are included. Cullman Wheel Co.

**141** **Adjustable Speed Drives** — Advantages and applications of adjustable speed Gyrol fluid drives are detailed in 8-pp Bulletin A-119. Cutaway view of typical unit is included, as well as selection tables, installation type drawings giving basic dimensions, and various mounting arrangements. American Blower Corp.

**142** **Flexible Couplings**—Torsionally flexible Morflex couplings are described in 24-pp Catalog C41-56. The Morflex principle, employing preloaded rubber biscuits as the flexible medium, is explained and illustrated. Complete dimensions and specifications are given on standard, double, and radial type couplings with additional data on coupling driveshafts. Torsional deflection charts and instructions for use explain the method of coupling selection in controlling torsional vibration of system. Morse Chain Co.

## LIGHTING, COMMUNICATIONS

**143** **Fluorescent Ballasts** — Bulletin GED-2416B, 12 pp, contains cross reference information for general line, rapid start, slimline, instant-start, and circline ballasts—all 60 cycle. The pocket-sized booklet lists other manufacturers' catalog model numbers comparable to company's designations referenced according to application requirements. General Electric Co.

**144** **Outdoor Mercury Lighting**—"How Mercury Vapor Outdoor Lighting Brings More Night Action," 8 pp, stresses low cost and versatility of mercury vapor lamps. Shows their use in such locations as industrial areas, parking lots. Includes data on company's new Silver White lamp, which offers an increase in efficiency over clear lamps. Also features Golden Mercury Vapor lamp, which provides a "warmer" light and is a natural caution light. Sylvania Electric Products Inc.

**145** **Light Hangers, Accessories** — Bulletin TH-56, 8 pp, covers company's line of hangers and accessories for indoor applications, featuring a mechanism which permits a maintenance man to lower inaccessible overhead lights to floor for servicing and then return them to operating position. Illustrates typical installations, outlines five major requirements for trouble-free installations, gives UL ratings and general specifications. The Thompson Electric Co.

**146** **Annunciator Systems**—Self-policing visual and audible annunciator systems are illustrated and described in this 20-pp catalog. In addition to listing the alarm systems, it also contains detailed information on what to consider when selecting an annunciator, wiring diagrams for alarm units, sample alarm sequences which may be common to many plants and other engineering data. Scam Instrument Corp.

## PUMPS, COMPRESSORS

**148** **High Pressure Pumps**—Eight-pp Catalog HP-1254 describes and illustrates company's Series HP controlled-capacity pumps for pressures to 35,000 psi and capacities to 2000 gph. Selection charts are provided for models with crank arm drive and yoke drive, along with application suggestions. Series HP pumps include some 298 models in three basic pump frame sizes for 2-, 3-, and 4-in. pump strokes. Specifications and design features are discussed. Philadelphia Pump & Machinery Co.

**149** **Air Compressors**—Bulletin A-62, 20 pp, covers construction, operation information on company's class WN-112 heavy-duty air compressors. Illustrates five models of compressor, for displacement capacities from 368 to 974 cfm at sea level, and four high altitude models for 532 to 1100 cfm. Joy Mfg. Co.

## INSTRUMENTS, CONTROLS

**150** **Control Operation Guide** — Bulletin GEA-6372 is a 32-pp manual explaining what each control product is, how it works, and where the device can be applied. Describes manual, magnetic, and reduced-voltage starters; push buttons; relays; limit switches; solenoids; pressure and vacuum, float, and plugging and anti-plugging switches. Photos, typical wiring diagrams, and cutaway views showing component features are included. General Electric Co.

**151** **Liquid Meters** — Sixteen-pp Bulletin OG-400, revised, offers new information on factors affecting meter selection. Includes more complete temperature, viscosity, pressure and registration data along with additional illustrations, an explanation of various metering terms and explicit ordering instructions. Describes company's oscillating piston meters for a variety of chemicals and industrial liquids. Offers data on meter construction and explains, with aid of tables and charts, which case, piston and chamber are suited for specific liquids. Meter and Valve Div., Rockwell Mfg. Co.

**152** **Precision Instruments** — Pocket-size Catalog 11 includes 128 pp of concise engineering data for use in the electronic and instrumentation fields, listing over 4,000 precision instrument and servo parts available from stock. Includes drawings, dimensional diagrams and complete tabulated specifications for a variety of precision parts—from shafts, bearings, gears and dowel pins, to hubs, clamps, cam assemblies, screws and washers. PIC Design Corp., Div., Benrus Watch Co., Inc.

Reader Service Cards for ordering bulletins are on pages 219-220. Be sure to include your name, job title, and company.

**153** **Static Control**—Bulletin GEA-6578, 8 pp, defines static control, lists advantages, and describes components of a general-purpose static control system. Explains how static control operates without moving parts, and covers logic function concept, logic functions and conventional control, basic principles of static control, circuit characteristics, monitor lights and amplifiers. General Electric Co.

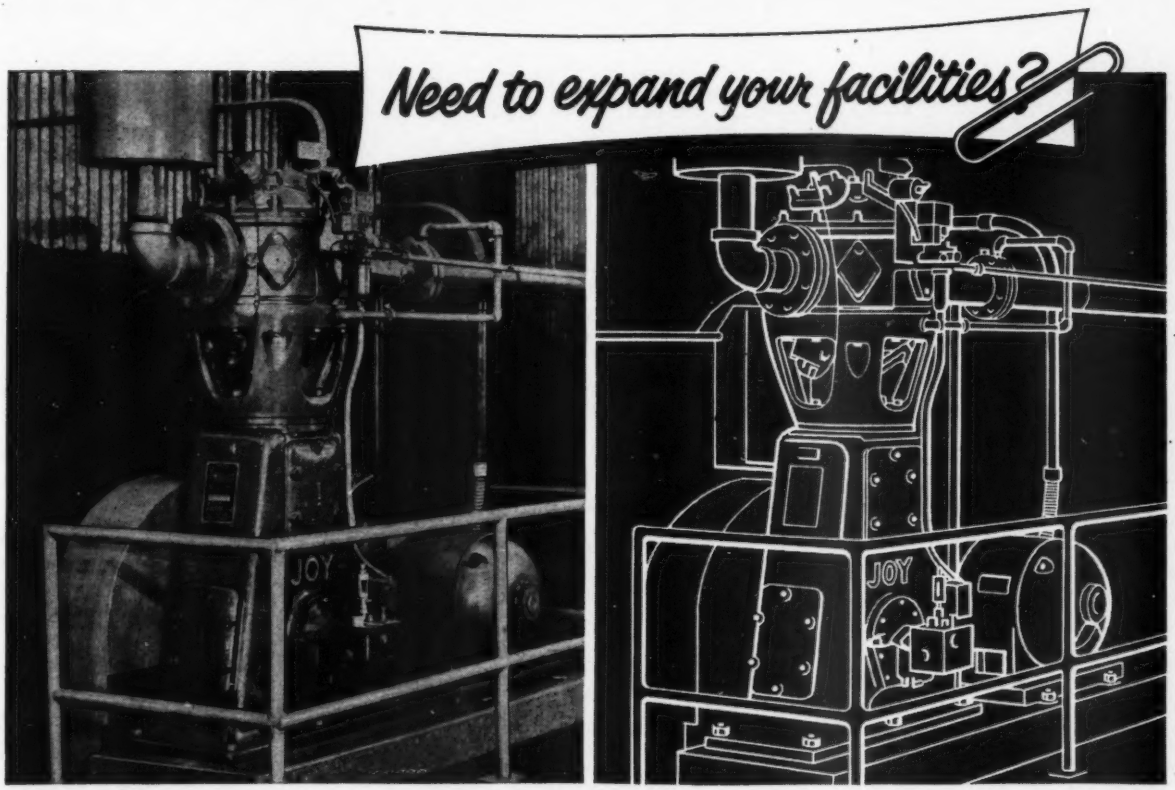
**154** **Kiln Instrumentation** — Folder N-0720 (1) is a 16-pp bulletin which shows in photos and diagrams how rotary kiln instruments and controls are used in the manufacture of cement, lime and other non-metallic products. Many pictures of actual on-the-job installations are used and complete details of operation are discussed. Leeds and Northrup Co.

## VALVES, PIPING, FITTINGS

**155** **Automatic Valves** — Cushioned automatic throttle and engine stop valves, steam and hydraulic check valves, steam pressure reducing and unloading valves, and non-return valves are described in this illustrated bulletin. Advantages are enumerated and sizes and pressure ranges given. Golden-Anderson Valve Specialty Co.

**156** **Gate, Needle Valves**—Forged steel gate and needle valves, specifically designed for the petrochemical, power and process industries are graphically described in 12-pp Bulletin DH-80. Lists material specifications, pressure-temperature ratings, working pressures, dimensions, and applications of the units. R-P & C Valve Div., American Chain & Cable Co., Inc.

(More Bulletins on page 221)




# Add compressed air power efficiently with the JOY WG-9

The Joy WG-9 *heavy-duty* vertical air compressor is a natural for supplying additional air for an existing system, either centralized or decentralized.

Because of its smooth running characteristics and the small floor area required, the WG-9 needs only a simple, block-type foundation. The average base dimensions of a larger model WG-9, *including motor,* are 7'1" by 4'1". This means greater capacity per square foot of floor area—42 CFM per square foot on the 100 psi rated machines.

*Thus, the WG-9 packs large compressor capacity in a small compressor area.* It is possible to install the machine in a central compressor room where unused floor space is at a premium, or in a decentralized plant location where crowding of machinery is a problem.

If you have plans for a small plant, the WG-9 is designed to give you continuous 24-hour heavy-duty service. It is also widely used to meet special requirements in larger operations, such as boosting air above standard plant pressures.

The Joy WG-9 is a water-cooled compressor, available in capacity ranges up to 881 CFM piston displacement and in pressures up to 150 psi. Standard drive is multiple V-belt. This machine can be furnished for flat belt or vee flat drive if desired.

**LARGE COMPRESSOR FEATURES INCORPORATED IN ALL WG-9 SERIES**

- Full Force Feed Lubrication
- Joy Patented "Dual-Cushion" Valves
- Anti-friction Main Bearings
- Replaceable Cylinder Liners and Crosshead Guides

Write today for full information. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

**Write for FREE Bulletin 22-15**

*Consult a Joy Engineer*

For Air and Gas Compressors, Oxygen and Nitrogen Generators, Vacuum Pumps and Boosters, Conveyors, Fans, Electrical Connectors, Hydraulic Fittings and Hose Assemblies.

W&D I 5854-22

JOY

SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

**For more facts circle 514 on Reply Card**

# "Heating in our switch was causing 'lights-out' shutdowns until we changed to cooler operating Fusetron Fuses"

*Thomas Lavin,* Building Engineer
Railway Exchange Building
Denver, Colorado

*Mr. Lavin Continues:*

"We had considerable trouble with heat developing in a lighting switch and causing fuse blows. It was very annoying having the lights go out so often—and having regular maintenance work interrupted to replace fuses.

"Checking with an ammeter we found the continued load to be 28 ampere. This indicated that 30 ampere fuses in use were the right size for safe protection. Nevertheless, the renewable fuses we had installed kept blowing.

"Evidently, what we needed were the same size fuses that would operate cooler to eliminate heating in the switch.

"At the suggestion of a salesman we tried 30 ampere Fusetron dual-element fuses. Our heating problem immediately disappeared. This was 7 or 8 months ago and we have had no trouble with the switch overheating—and our—'lights-out' shutdowns are a thing of the past."

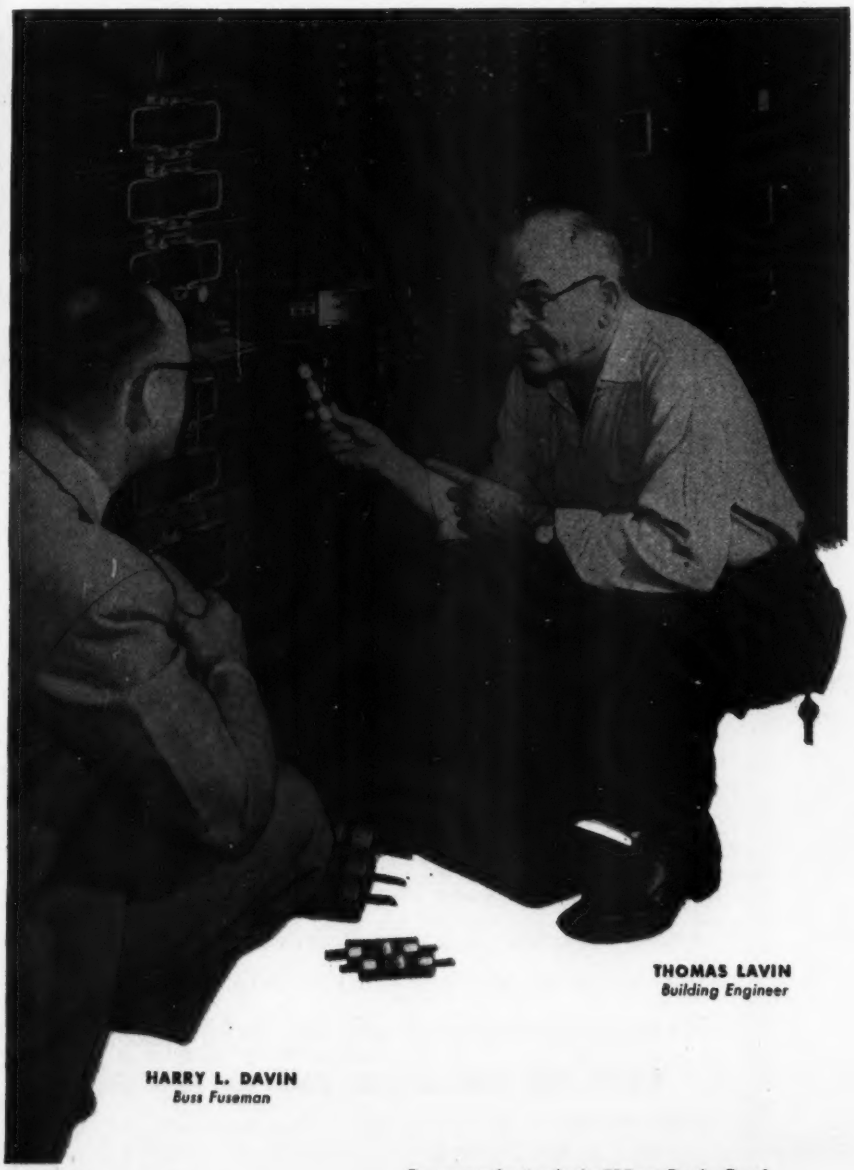
## *Here's why Fusetron Fuses protect against needless blows caused by excessive heating of panels and switches*

Fuses, like other protective devices operate from heat created by the current flowing through them. Thus they produce some heat even in normal operation.

Sometimes the heat is not dissipated from switches and panels fast enough. This piled up heat over-heats fuses and reduces their carrying capacity. Then fuses often blow even though not loaded to their rated capacity.

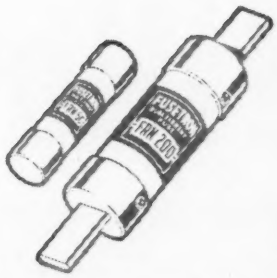
A logical answer to this heating problem is the use of Fusetron fuses. Fusetron fuses produce less heat because they have less electrical resistance than ordinary fuses. For example, ordinary fuses have 55 to 117% greater resistance than Fusetron fuses in 250 volt sizes and up to 140% greater resistance for 600 volt sizes.

Since the lower resistance of Fusetron dual-element fuses means less generation of heat, switches and panels operate much cooler. This materially reduces or wipes out entirely useless shutdowns caused by fuses blowing due to overheating of panels and switches.



**THOMAS LAVIN**
*Building Engineer*

**HARRY L. DAVIN**
*Buss Fuseman*




*Save time, trouble and money by using Fusetron dual-element Fuses.*

**THEY PROVIDE 10 POINT PROTECTION**

**1** High interrupting capacity—protect against heaviest short circuits. Have proven on tests to open safely on circuits set to deliver in excess of 100,000 amperes. **2** Protect against needless blows caused by excessive heating—lesser resistance results in cooler operation. **3** Protect against needless blows caused by harmless overloads. **4** Provide thermal protection—for panels and switches against damage from heating due to poor contact. **5** Protect against waste of space and money — permit use of proper size switches and panels. **6** Protect motors against burnout from overloads. **7** Give DOUBLE burnout protection to large motors—without extra cost. **8** Protect motors against burnout due to single phasing. **9** Make protection of small motors simple and inexpensive. **10** Protect coils, transformers and solenoids against burnout.

*Write for bulletin FIS.*

**FOR LOADS ABOVE 600 AND UP TO 5000 AMPS. — USE BUSS Hi-Cap FUSES!**

They have an interrupting capacity sufficient to handle any fault current regardless of system growth.

They can be coordinated with Fusetron fuses on feeder and branch circuits to limit fault outages to circuit of origin.

*Write for bulletin HCS.*

***Play Safe!** install FUSETRON dual-element Fuses and BUSS Hi-Cap Fuses throughout entire Electrical System!*

**BUSSMANN MFG. CO.**
(Div. of McGraw Electric Co.)
University at Jefferson,
St. Louis 7, Mo

FUSETRON
BUSS

157

For more facts circle 515 on Reply Card

*Production of popular pipe insulation has been increased 150% so that —*

# Now EVERYONE

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**AMARILLO**, Ball Distributing & Engr. Co.
**APPLETON**, J. D. Wilson Co.
**ATLANTA**, Ga., Southern States Iron Roofing Co.
**BILLINGS**, Mont., L. W. Worthington
**BIRMINGHAM**, Ala., Shook & Fletcher Supply
Southern States Iron Roofing Co.
**BROOKLINE**, Mass., Homans-Kohler, Inc.
**BUFFALO**, Frontier Insulation & Supply Co.
**CHARLESTON**, W. Va., Baldwin Asbestos Products Co.
**CHARLESTON HEIGHTS**, S. C., Stafford Insulation Co.
**CHARLOTTE**, N. C., Guy M. Beaty & Co.
**CHATTANOOGA**, Guy M. Beaty & Co.
**CHICAGO**, E. C. Carlson Co.
**CINCINNATI**, R. E. Kramig & Co.
**CLEVELAND**, The Miles Materials Co.
**COLUMBIA**, S. C., Southern States Iron Roofing Co.
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**DALLAS**, Insulation Supply Co., Inc.
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**FT. WORTH**, The Bracken Co.
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**IRON MOUNTAIN**, Mich., Champion, Inc.
**JACKSON**, Miss., Paine Refrigeration Supply Co.
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**LITTLE ROCK**, Gunn Distributing Co.
**LOS ANGELES**, Western Fibrous Glass Products
Plant Insulation Co.
**LOUISVILLE**, General Insulation & Roofing Co.
**MADISON**, Wis., J. D. Wilson Co.
**MEMPHIS**, John A. Denie's Sons Co.
**MIAMI**, Southern States Iron Roofing Co.
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**MINNEAPOLIS**, Asbestos Products, Inc.
**MOBILE**, Ala., Shook & Fletcher
**NASHVILLE**, Southern States Iron Roofing Co.
**NEWARK**, N. J., Eastern Steam Specialty Co.
**NEW HAVEN**, Conn., Insulation Supply Co.
**NEW ORLEANS**, Eagle Asbestos & Packing
**NEW YORK**, Eastern Steam Specialty Co.
**OKLAHOMA CITY**, Ball Distributing & Engineering Co.
**OMAHA**, Cardinal Supply & Mfg. Co.
**PHILADELPHIA**, John F. Scanlan, Inc.
**PITTSBURGH**, Dravo Corp.
**PHOENIX**, Ariz., Kircher Asbestos & Rubber Co.
**RALEIGH**, N. C., Southern States Iron Roofing Co.
**RICHMOND**, Va., Southern States Iron Roofing Co.
**ROCKFORD**, Ill., Mott Brothers Co.
**SALT LAKE CITY**, Bullough Asbestos Supply Co.
**SAN ANTONIO**, The Bracken Co.
**SAN DIEGO**, Western Fibrous Glass Products
**SAN FRANCISCO**, Western Fibrous Glass Products
**SAVANNAH**, Ga., Southern States Iron Roofing Co.
**SCHENECTADY**, N. Y., Jon Tree Sales & Supply Co.
**SEATTLE**, Western Fibrous Glass Products
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**SYRACUSE**, N. Y., Industrial Supply Co.
**TAMPA**, Fla., Eagle Roofing & Art Metal Works, Inc.
**TALLAHASSEE**, Fla., Capital Refrigeration & Supply
**TULSA**, Okla., Ball Distributing & Engr. Co.
**TUPELO**, Miss., Paine Supply Co.
**WASHINGTON**, Walter E. Campbell Co., Inc.
**WICHITA**, Jamar-Olmen Construction Co.
**VANCOUVER**, B. C., Fleck Brothers Limited

GUSTIN gb BACON

## SNAP*ON ... THE ONE AND ONLY ONE-PIECE MOLDED PIPE INSULATION OF FINE GLASS FIBERS

Sensational demand has kept Snap*On in short supply ever since its introduction several years ago — but now *everyone* can get Snap*On! To meet the ever-growing demand for this new lightweight insulation that "just snaps on the pipe", we recently made a substantial addition to its production facilities to increase Snap*On production by 150%. These new facilities are turning out the same beautifully uniform one-piece sections that have won such amazing acceptance throughout industry. Here, in a nutshell, is why Snap*On is the *standard specification* in so many industries:

**Highest thermal efficiency** of any pipe insulating material on the market in its temperature range.

**Lower applied cost** — just spread the single seam and it snaps on the pipe.

**Extremely light weight** . . . virtually immune to damage or breakage . . . permanent as glass itself.

So figure Snap*On in all your plans for dual-temperature, cold or heated piping where temperatures do not exceed 350° F. Whether on straight runs, on nested or tracer lines, or at flanges, valves and fittings, Snap*On's flexibility will save you time and money. It's available *now* . . . in sizes from ½" to 33" IPS from your local Snap*On distributor. His name is listed in the column at left. Call him now or—

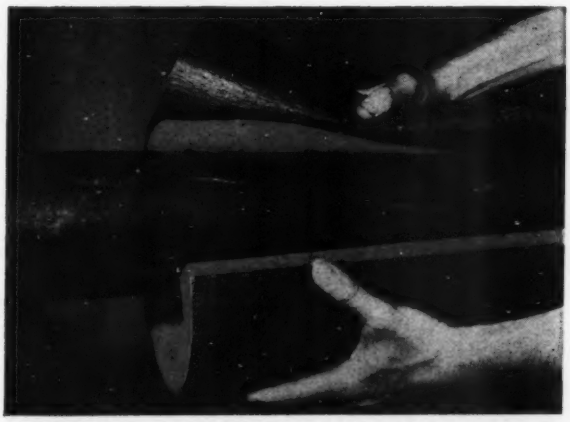
**WRITE FOR NEW 8-PAGE SNAP*ON BROCHURE**

*Trademark Reg.

# can get SNAP*ON!

**SNAP*ON . . . FOR LOW PRESSURE STEAM AND HOT WATER.** For smaller lines carrying hot water or low pressure steam at temperatures up to 250°, ½" thick Snap*On is thermally superior to thicker insulations and far easier to install. Despite its light weight, its tough, resilient structure resists mechanical abuse. Snap*On *cannot* shrink and is not affected by moisture.

**SNAP*ON . . . FOR SERVICES TO 350° F.** In wall thicknesses from ¾" to 3" Snap*On is an ideal pipe insulation for industrial processing plants and for commercial and institutional buildings, both from the standpoint of initial cost and long-range heat savings. It is available plain, or canvas jacketed, in sizes from ½" to 33" IPS.



**SNAP*ON . . . FOR DUAL-TEMPERATURE AND COLD PIPING.** For such service, Snap*On is available with a wide variety of factory-applied jackets that solve every problem involving appearance, vapor resistance and fire resistance. All jacketed Snap*On comes in easy-to-handle, easy-to-apply 3' sections.

**SNAP*ON . . . FOR BIG PIPING, INDOORS OR OUT.** Just one easy spread-and-snap motion of the single seam—and 6 feet of 16" pipe is insulated! Fewer seams mean faster application, and far greater thermal efficiency. Plain Snap*On is available in these 6-ft. sections in sizes from 6" - 33". For outdoor use, it can also be supplied with factory-adhered weatherproofed jackets.

**GUSTIN-BACON** *Manufacturing Company*

GUSTIN gb BACON

Thermal and acoustical glass fiber insulations • Pipe couplings and fittings • Molded glass fiber pipe insulation

**244 W. 10th St., Kansas City, Mo.**

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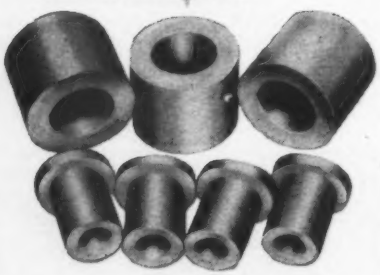
Chempro
FM-4
COMBINES TEFLON GLASS GRAPHITE INERT LUBRICANTS
into an
INERT HARD FRICTIONLESS BEARING MATERIAL



Chempro's new Style FM-4 bearings, bushings, washers, etc., have given remarkable service in pumps, mixers and reactors operating under highly corrosive conditions. Style FM-4 bearings and bushings are hard, corrosive-resistant, have a low coefficient of friction, and compare favorably in wearability with those made of metal.

*Write for Bulletin CP554.*

*THE ORIGINAL FABRICATORS OF TEFLON* PACKINGS AND GASKETS*

*duPont Trademark

CHEMICAL & POWER PRODUCTS, Inc.
7 Broadway, New York 4, N. Y.

For more facts circle 517 on Reply Card

# BACKTALK and FORETHOUGHTS

*Edited by Marjorie E. Weissman*

## Working With Architects and Contractors

PLANT ENGINEERING:

"Some few months ago you recommended 'Plant Engineering Handbook' to me and it has been very useful.

"Perhaps you will be good enough to help me again? I am interested in a book which deals with the relation of the architect, contractor and owner. We are contemplating the construction of a new home office building which will cost several million dollars and I would like to get information on how such a job is handled. Such information should cover the different types of contracts, how executed, how contractors' charges are verified, etc.

"If there is such a publication which deals with this matter in a detailed, practical way, rather than just its ethics and legality, I would be very anxious to know the source. As before, your help will be very much appreciated." *J. B. Baldwin, Superintendent of Buildings, National Life Insurance Co., Montpelier, Vt.*

▶ We have supplied Mr. Baldwin with the names of several books which may be helpful. In addition, some of the papers presented at the Plant Maintenance and Engineering Conferences might also supply the type of information needed. If any of our readers have suggestions to offer, we are sure Mr. Baldwin will be glad to receive them.—*Editors.*

## Drafting Room Lighting

PLANT ENGINEERING:

"We are going to relight our drafting room and would appreciate any information you may have on the installation, type of fixtures, intensity, diagonal vs perpendicular, etc." *E. L. Shaver, Plant Engineer, Sprout, Waldron & Co., Inc., Muncy, Pa.*

▶ Basic information on lighting is available to our readers in the booklet "Industrial Lighting," a collection of 12 articles reprinted from PLANT ENGINEERING. The Illuminating Engineering Society should also be able to furnish information along these lines.—*Editors.*

## Ultrasonic Cleaning

PLANT ENGINEERING:

"At the 1954 Machine Tool Exposition in Chicago, Ill. there was, on demonstration, a machine for cleaning small parts, using a solution agitated by high frequency sound waves.

"We believe that such a machine could be of use to us in removing stencil paste from metal stencils.

"Any information you may have as to the manufacturer and capabilities of such a machine, or machines, that might be applicable to this cleaning operation would be appreciated." *A. M. Cary, Manager, Hayne Car Shop, Southern Railway System, Spartanburg, S. C.*

▶ Readers interested in ultrasonic methods of cleaning refer to an industrial directory for the names of manufacturers of equipment for this purpose.—*Editors.*

## Reprinting Article on Aluminum

PLANT ENGINEERING:

"We anticipate a considerable amount of interest in the article 'Aluminum

Roofing and Siding—Where To Use It, What To Choose and How To Apply It,' which appeared in the October, 1956 issue of PLANT ENGINEERING. We would like to obtain 2000 reprints. If reprints are not available, may we have permission to reproduce the article locally by photolith process?" *L. C. Andrews, Aluminum Company of America, Pittsburgh.*

▶ As always, we are happy to reprint an article on request, if the type is still available, or to give permission to reprint it locally.—*Editors.*

## You're Welcome!

PLANT ENGINEERING:

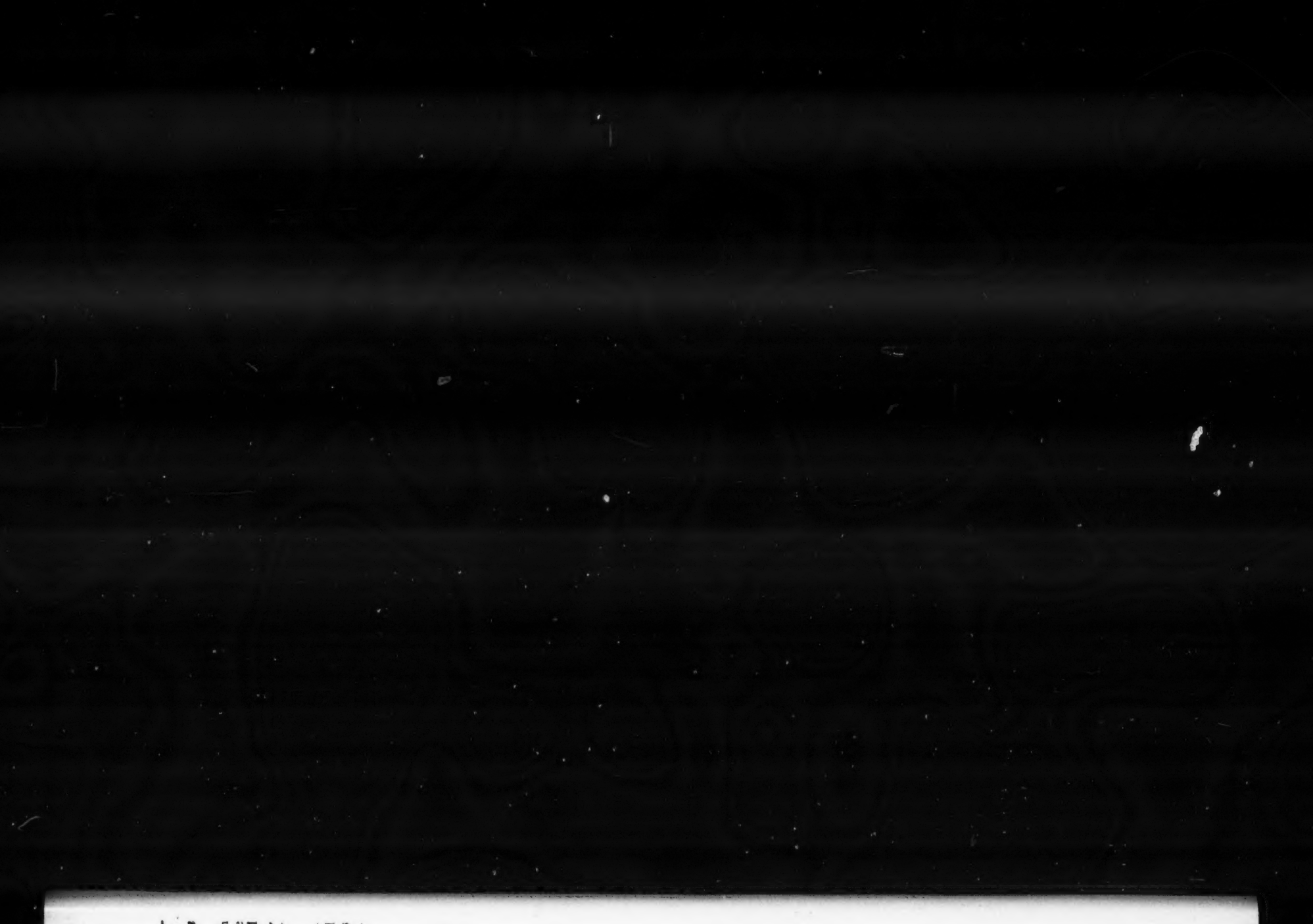
"We would like to thank you very much for your letter of October 2, enclosing a brochure on the Machinery and Allied Products Institute accounting method.

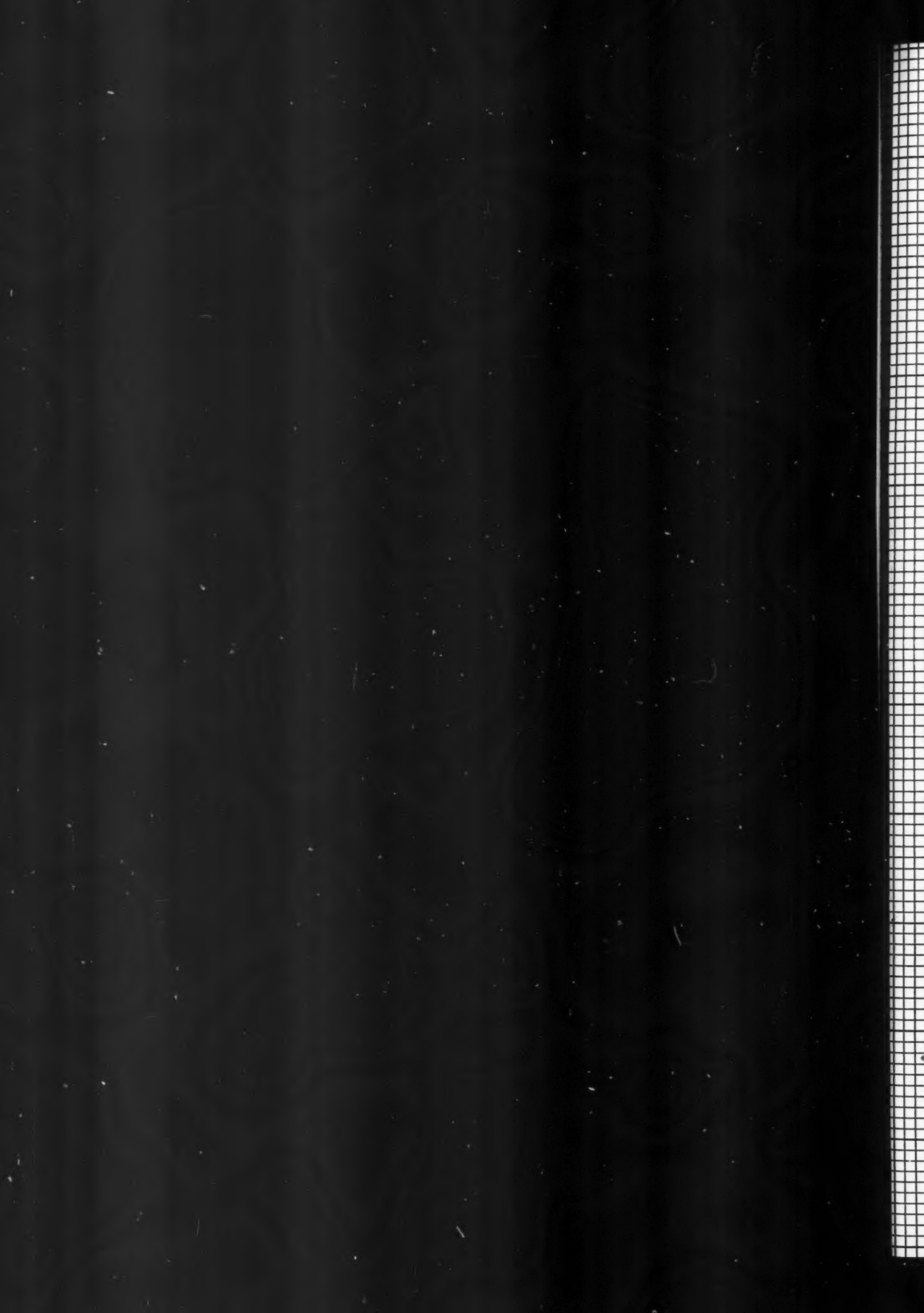
"The Secretary of MAPI has, on your suggestion, also written to us and has sent us further literature.

"We wish to express our appreciation for the trouble you have taken to make this information available to us." *J. Celler, for Factory Manager, African Explosives and Chemical Industries, Ltd., Modderfontein Dynamite Factory, P. O. Northrand, Transvaal, Africa.*

PLANT ENGINEERING:

"Thank you for your copies of the 'Bibliography on Control of Radioactive Wastes' which you sent us recently. I





*In a water conditioning service... results make the difference!*

■ CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

*W. H. & L. D. BETZ, Philadelphia, Pa.*

Ford Foundry
uses JOY
LIMBEROLLER
Belt Conveyor Idlers

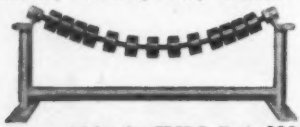
*Joy Limbercllers at work on a belt conveyor at Ford's Cleveland Foundry.*

This radical, new idler is used in handling abrasive foundry sands at Ford's Cleveland Foundry. Each idler is a single roller consisting of a series of pressure-molded neoprene or rubber discs on a flexible steel cable. Only two bearings are used and these are up out of the dirt zone.

Joy's new belt conveyor idler has already given over *twelve times* the service life of conventional idlers in handling many difficult materials . . . abrasive foundry sands, coal, petroleum coke, potash, copper ores, mill tailings iron ore, wet concrete, triple superphosphate, ammonium sulphate and sticky fertilizers.

The Limberoller is unaffected by most corrosives that damage steel . . . is ideal for chemical, sulphur and salt plants.

Get details from *Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.* In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*



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JOY

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# BACKTALK

am sure this list will be of great interest and help to us." *A. F. Gallistel, Director, Physical Plant Planning, University of Wisconsin, Madison, Wis.*

## Yes, What Happened to Ecuador?

PLANT ENGINEERING:

"What in the world happened to Ecuador? I realize that the map of South America on page 87 of the November, 1956 issue of PLANT ENGINEERING is just a sketch, but please let's not forget that beautiful little country that fits between Columbia and Peru like a slice of pie someone has nibbled!

"Ecuadorian friends of PLANT ENGINEERING might take exception to this apparent slight by your artist . . . Don't you think?" *Jessie K. Brown, Engineering Librarian, Engineering Library, American Oil Co., Texas City, Tex.*

► Somewhat embarrassed, we offer our sincere apologies for omission of Ecuador from our sketch map of South America. The authors of our story did not visit Ecuador and this is the only reason we can conjure up for our artist not including it in the map. In other words—we goofed!—*Editors.*

## Repairs With Resins and Glass

PLANT ENGINEERING:

"We read a very interesting article in the October, 1956 issue of PLANT ENGINEERING entitled 'Leaks Licked by Resins and Glass.' We wonder if it would be possible for you to send us 10 reprints of this article, or if these are not available, we would be willing to purchase 10 copies of that particular issue." *Gertrude G. Kaye, Smooth-On Manufacturing Co., Jersey City, N. J.*

## Maintenance Program Planning

PLANT ENGINEERING:

"Due to recent expansion, our concern is reorganizing and starting new procedures. My interest lies in the maintenance department. We are a manufacturer of aircraft instruments with approximately 5000 employees.

"I am presently concerned with the following:

1. A lubrication program of all machine tools as well as plant equipment and compressors, air conditioning units, etc.
2. A preventive maintenance program that incorporates periodic inspections of machine tools, plating equipment, and buildings, etc., so that breakdown may be minimized and costs thereby reduced.
3. A system so that all repairs, preventive maintenance inspection, moves, etc. are coordinated into some procedure so that all costs may be properly allocated to their respective departments, as well as the particular machine tool requiring maintenance. This includes the keeping of time and material for each job.

"By the proper selection of a procedure we would like to be able to estimate how much time the job will take and also how many people we shall require in the future of our maintenance department.

"If you can be of any help to me in offering some assistance through past articles on the subject matter, it would be greatly appreciated." *Sheldon J. Fuchs, P.E., Industrial Engineer, Plant Engineering Dept., Kollsman Instrument Corp., Elmhurst, N. Y.*

► We have forwarded to Mr. Fuchs a number of articles from previous issues of PLANT ENGINEERING, which we hope will be helpful, but if readers who have set up similar programs from scratch, care to offer any suggestion to Mr. Fuchs, we are sure he will be glad to hear from them. —*Editors.*

## Epoxies as Steel Protection

PLANT ENGINEERING:

"We noted two articles of interest in the October, 1956 issue of PLANT ENGINEERING.

"If tear sheets are available, we should

like to obtain two copies each of the following: 'Epoxy Corrosion Preventers' by A. G. Sternberg, Steelcote Manufacturing Co., on page 103 and 'PVC Tank Liner' on page 112." *G. S. Sellers, Plant Engineer, Colgate-Palmolive Co., Berkley, Calif.*

PLANT ENGINEERING:

"I should like to request six copies of the article titled 'Epoxy Corrosion Preventers—Guide to Steel Protection with Emphasis on Epoxy Formulations,' by A. G. Sternberg, Technical Director, Steelcote Manufacturing Co. The article appeared in your October, 1956 issue and I should like to distribute copies to personnel within my plant." *A. P. Beckett, Shop Operations Manager, D-C Clock Shop Operations, Clock and Timer Dept., General Electric Co., Worcester, Mass.*

## Relamping For Fluorescents

PLANT ENGINEERING:

"We are studying our fluorescent relamping problems and would appreciate it very much if you would send copies of articles that you have published in your magazine within the past three years, describing a preventive maintenance and relamping program." *E. C. Denny, Project Engineer, The Courier-Journal, Louisville Times, Louisville, Ky.*

► Tear sheets of articles which we hope will help Mr. Denny with his problems, have been sent to him.—*Editors.*

# B.F.Goodrich

Sangamo Electric Co., Springfield, Illinois

# That spray tree died every 60 days ... until they installed Koroseal

It used to be that a day a week was spent in maintenance on that air wash system. Even then, every 30 to 60 days the pipe had to be replaced. Hydrochloric acid and nitric acid fumes were too corrosive for the steel pipe to handle.

Then a B.F.Goodrich Koroseal salesman suggested rigid Koroseal pipe. It has been in operation for more than a year now and shows no sign of deterioration. The weekly maintenance expense has stopped too.

Using Koroseal polyvinyl chloride to handle corrosive materials has solved an expensive maintenance and replacement problem for many progressive manufacturers. Your corrosion problem may be solved by Koroseal too.

Koroseal PVC is unaffected by most alkalies and acids. It is completely inert in the presence of oil, alcohol and salt solutions. Unusually strong, it has high impact resistance.

Koroseal rigid pipe is exceptionally easy to install. It can be threaded with standard pipe threading equipment, quickly joined to Koroseal valves and fittings. It is available in various pressure schedules. Koroseal PVC comes in tubing, valves, rods, sheets and can be welded, sawed, drilled and machined. It has excellent insulation properties, will not support combustion, never needs painting. For more information fill in and mail the coupon at the right.

*B.F.Goodrich Industrial Products Company, Marietta, Ohio.*

**For more facts circle 520 on Reply Card**

**B.F.Goodrich**

**INDUSTRIAL PRODUCTS CO.**

**B.F.Goodrich Industrial Products Co.**
**Dept. PE-1**
**Marietta, Ohio**

Please send me free booklets on:

- ☐ Rigid Koroseal Pipe
- ☐ Rigid Koroseal Sheet

**Name**_____

**Company**_____

**Address**_____

**City**_____ **Zone**____ **State**_____

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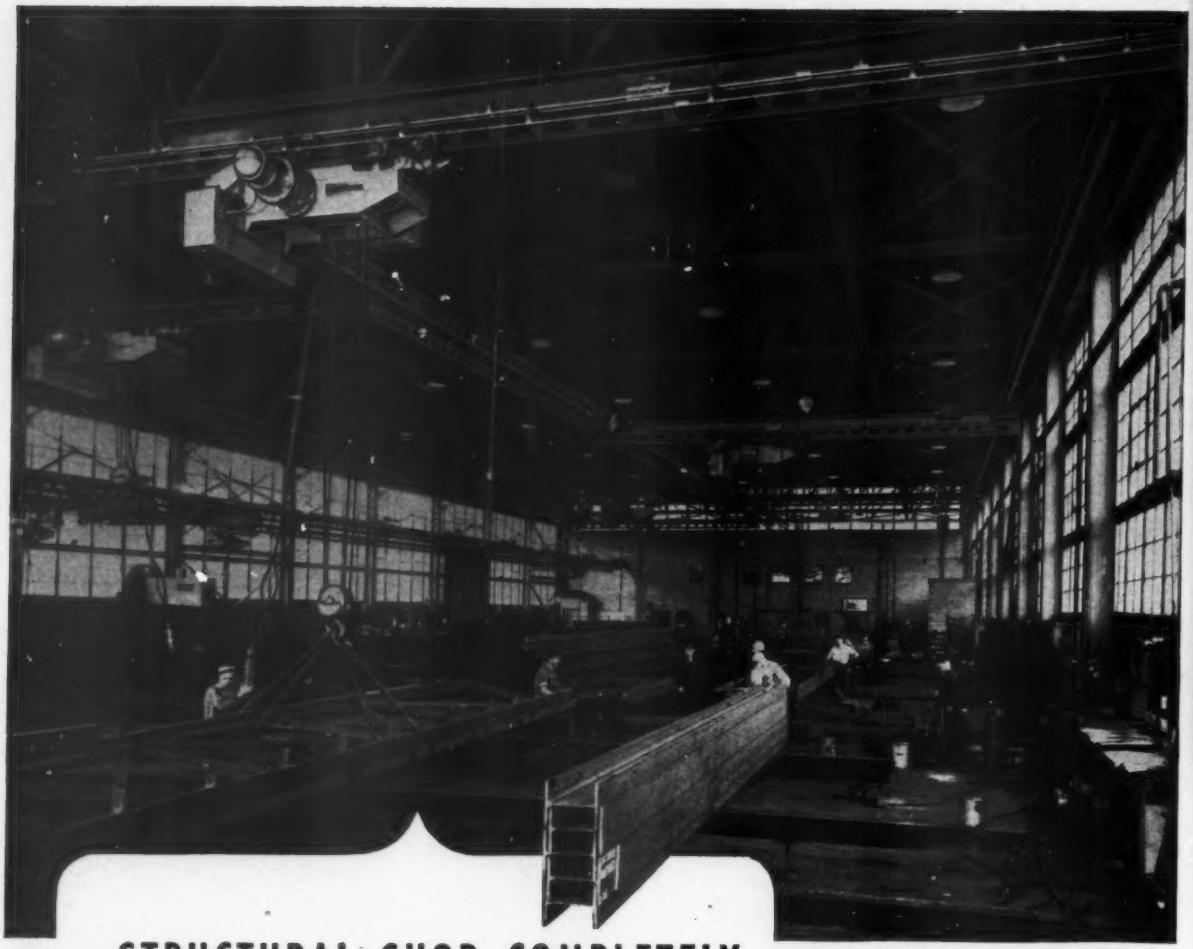

# STRUCTURAL SHOP COMPLETELY COVERED WITH TRANSFER CRANES

*... Eliminate Lost Time Waiting for Crane Service*

*... Enable Direct Fast Delivery Between Any Points in Shop*

*... Hoist Carriers Can Be Used Together or Separately in Accordance With Load Requirements*

In this area are six motor driven 5 ton, 38′ 0″ span transfer cranes on two runways. Any crane on one runway may be interlocked with any crane on the other runway, permitting a hoist carrier to transfer from one to the other. Not only does this permit direct delivery of loads between any two points in the shop, it allows two hoist carriers on one crane to support both ends of a long truss when desired.

Along the wall at left three two ton, 12′ 0″ span hand propelled cranes with electric hoists handle beams in and out of a punching machine and spacing table.

A BIG factor in the rapid growth of Standard Iron & Steel Works, Limited, Toronto, Canada, is acknowledged to be their wide use of Cleveland Tramrail transfer cranes. This equipment makes possible a highly efficient operation, greatly speeds production and cuts costs.

Cleveland Tramrail equipment has been used at Standard Iron from their early days in the fabricating business. As the company has expanded, more Tramrail has been added. Today Standard Iron is one of the foremost companies in the Toronto area in the design, fabrication and erection of structural steel for buildings and bridges.

For live, aggressive companies like Standard Iron & Steel Works, Limited, Cleveland Tramrail has much to offer. It provides real help in the struggle with rapidly rising production costs. A nearby sales engineer will gladly give you details.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 7517 E. 290 ST. • WICKLIFFE, OHIO

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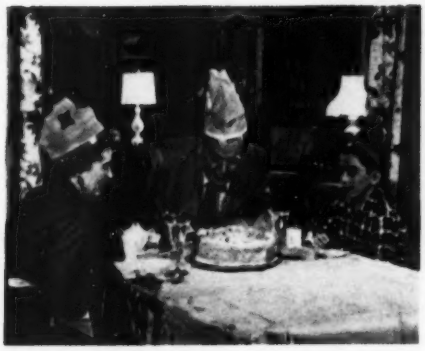
For more facts circle 522 on Reply Card

SHOWING
AT THE 1957
PLANT MAINTENANCE
AND ENGINEERING SHOW
CLEVELAND, JAN. 28-31
**BOOTH 1020**
"Productive Maintenance"

**See for yourself . . .**

# How Jim Hamilton of Dawson & Egglesby reduced breakdowns, increased output by switching to *Productive Maintenance*

**1** IT ALL BEGAN (in this film) when Maintenance Superintendent Jim Hamilton's wedding anniversary party was interrupted by the telephone. . .



**2** . . . a breakdown at the plant! Same thing on his birthday, too — just as he was blowing out the candles. In fact, the phone rang every time the Hamiltons planned something.

**3** Telephonitis was afflicting Jim. It seemed the phone was always ringing to announce a breakdown at the plant. So, his doctor suggested a hobby.

GENERAL ELECTRIC

PLEASE TURN PAGE

CONTINUED FROM PRECEDING PAGE

## Emergency equipment downtime was

**4** That's why Jim bought a gun. He decided to hunt ducks and showed his son how it is done. The question was: when could he find the time?

**5** He'd have to guarantee himself time. So he planned to isolate three days against every kind of maintenance trouble. He drew up work orders and schedules for his men.

**6** They pitched in. They greased, tightened, adjusted, overhauled. And to make sure Jim got his trip, one main drive motor was greased twice.

## ...then he called in his General Electric

**10** The cost of repairing the motor was only one of Jim's worries. More important, men and machines were idle . . . production stopped.

**11** Downtime was costing a lot of money and Jim's boss, Egglesby, "Old Eaglebeak," wasn't very happy. Jim decided to call his General Electric Service Shop for assistance.

**12** To George, the General Electric maintenance specialist, Jim's problem was nothing new. He told Jim he'd be over right away.

## ...and saw how his problem could be solved

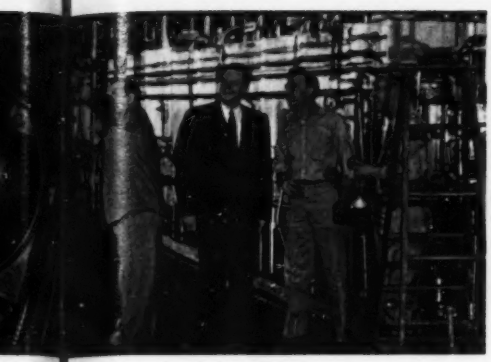
**16** George pulled out some literature from his brief case and showed Jim the advantages of General Electric's *Productive* Maintenance plan...

**17** "There are five steps in this new approach to maintenance. First, gather complete equipment data from your machines and motors, and compile a record system.

**18** "Second, determine the amount of routine maintenance needed by deciding how much care is warranted by the function and cost of the equipment.

GENERAL ELECTRIC

## becoming a major problem for Jim Hamilton...



**7** When they were finished, the plant looked like a battle cruiser ready for the admiral. Jim was demonstrating his shooting technique when . . .

**8** . . . in spite of all the overhauling and greasing they had done, one of the main drives broke down. Jim slumped as he saw the whole production line coming to a standstill.

**9** Up in smoke went the main drive and up in smoke went Jim's hunting trip. Apparently a lot of maintenance wasn't the answer either.

## maintenance specialist for help...

**13** Jim explained his problem: what he needed was a crystal ball to tell him in advance when and where those expensive breakdowns would occur.

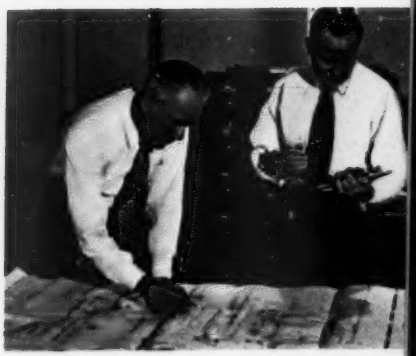
**14** "You can have a crystal ball," said George, "part of it will be a record system that will tell you when to inspect, when to overhaul, and what your upkeep costs are . . .

**15** "The rest of your crystal ball will be any good inventory control system to keep track of renewal parts. Two systems make your crystal ball."

## with General Electric's *Productive Maintenance* plan...

**19** "Third, put your records to work. Set up a routine operating control system, with regular inspection cycles, work orders, and spare parts stocks.

**20** "Fourth, inspect and evaluate all equipment *vital* to production continuity, to help you determine critical parts protection and overhaul requirements.



**21** "Fifth, establish a critical maintenance program: schedule overhauls to reduce breakdowns. Stock parts to minimize downtime cost."

## ...to help raise productivity, cut product cost...

PLEASE TURN PAGE

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## So Jim Hamilton set up his own *Productive* Maintenance program . . .

**22** Jim, sold on *Productive* Maintenance, started his own program at once. Electric equipment needing overhaul was scheduled into nearest General Electric Service Shop.

**23** And the stock room at Dawson & Egglesby became a model of efficiency. Now, when critical parts for key machines are needed, they're always available. As for Jim, well . . .

## . . . licked his maintenance problem . . . and made his management happy!

**24** . . . he always bags his limit now when he goes duck hunting. The Hamiltons never miss an anniversary celebration. And Jim's telephonitis . . . that's been cured for good.

**25** One more thing: Jim's boss Egglesby, "Old Eaglebeak," was delighted. He saw production up and maintenance costs down. What management wouldn't be delighted?

## How your General Electric maintenance specialist can help organize a *Productive* Maintenance program

**Now that you've reviewed the highlights, SEE G.E.'s FILM: "PRODUCTIVE MAINTENANCE"**

**General Electric Company**
**Apparatus Sales Division, Section 801-19**
**Schenectady 5, N.Y.**

I would like to schedule a showing of your film "*Productive* Maintenance."

Please send me the detailed manual (GEA-6087) on setting up a *Productive* Maintenance program in my plant.

NAME_____

POSITION_____

COMPANY_____

CITY_____ STATE_____

**1. Supplying Complete Parts Data.** He can identify all renewal parts in each unit of electric equipment to complete basic records.

**2. Planning Routine Maintenance and Inspection.** He can offer upkeep guidance and help organize inspection trips and routine maintenance by examining your equipment and establishing the periodic checks needed.

**3. Establishing Routine Renewal Parts Inventory.** He can tailor a renewal parts program to your plant, help you set up a parts inventory system.

**4. Analyzing Critical Equipment for Best Protection.** He can tell you how long repairs will take and the cost per job, plus recommending major spare parts protection.

**5. Determining Condition of Critical Equipment.** He can assess the condition of such equipment, and schedule men and machines at the nearest of 51 G-E Service Shops, to help you during planned overhauls.

To put *Productive* Maintenance to work for you call your nearest G-E Apparatus Service Shop or Sales Office.

## *Productive* Maintenance as vital as production itself!

GENERAL ELECTRIC

# Good News Norgren

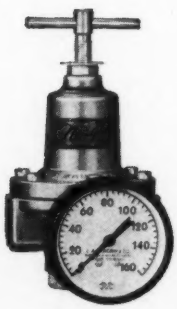
for design engineers and PLANT ENGINEERS

## ANNOUNCES

**Important New Developments in Compressed Air Filters and Pressure Regulators**

## NEW Norgren Air Line Filters

- **LESS PRESSURE DROP** — larger passages and larger filter element.
- **BETTER LIQUID REMOVAL** — Improved louver plate and baffle design. Removes more liquid from the compressed air line.
- **CHOICE OF FILTER ELEMENT**—interchangeable filter elements, 74, 64, or 25 micron.



## NEW Norgren Pressure Regulators

- **GREATER ACCURACY OF REGULATED PRESSURE** — balanced valve and increased effective diaphragm area provide improved accuracy over a wide operating range.
- **RELIEVING OR NON-RELIEVING TYPE AVAILABLE**
- **IMPROVED RELIEVING CHARACTERISTICS** — automatic relief of excess pressure. Holds system pressure close to regulator setting.

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For more facts circle 522 on Reply Card

# PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

*Edited by Marjorie E. Weissman*

## Waste Treatment System Ignores Power Failure

WASTE MATTER, consisting largely of chromates and acids, is neutralized by adding alkalis or acids as needed at the Electric Auto-Lite Co. plant in Sharonville, Ohio. The addition of acid or alkali is automatically controlled by pneumatic pH and redox controllers that are equipped with auxiliary electric switches.

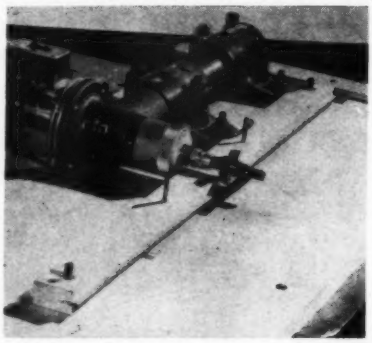
The system, designed by Robert L. Winston, Senior Process Engineer at the Sharonville plant, is dependent on continuous supplies of electrical current and compressed air, but careful selection of diaphragm control valves and care in adjustment, has provided protection from complete shutdown on failure of air supply, so that the system functions adequately even when air or electrical current fails. In such a situation, various direct and reverse acting valves take positions that provide satisfactory minimum treatment except under very unusual plant operations.

Should electrical current fail, two additional relays are connected between the main air supply line and the instrument electrical circuit. The relays have no effect on the air supply to the instruments as long as instrument power is maintained. Should electrical current fail, the two relays shut off the air supply to the controllers. Thus, the valves take the same positions that they would on failure of the air supply, still providing adequate waste treatment. *From Industrial Control News, published by Industrial Div., Minneapolis-Honeywell Regulator Company, Philadelphia, Pa.*

## Fast Tenoning

SAW AND a shaper head have been combined at the Walter P. Sauer & Sons Long Island City plant to make a tenon in one operation.

In the manufacture of office furniture, drawer bottoms are tenoned in this special setup to fit grooves in drawer sides. The saw is fitted with a shaper blade. A shaper head, fitted with the same size blade, has been mounted above the blade in the saw. With this arrangement, accurate tenons are made in one pass through the machine.



**Shaper head with blade mounted above saw blade makes possible fast tenoning**

Formerly, tenons were shaped on a single-blade machine. The shaper blade had to be carefully set each time a board of different thickness was passed through to insure tenons of uniform thickness. Setting the blade accurately was a time consuming operation and, because board thicknesses might vary from piece to piece, it was difficult to get uniform tenons.

**(Continued on page 40)**

## Platform Truck Does Tough Steel Mill Duty

MAJOR PROBLEM of transporting steel billets from storage yard to batch furnace, at a mid-western steel mill, has been solved by a burden carrier.

Production increases at the plant required expansion of storage facilities adjacent to batch furnaces. This meant that the farm-type tractor, used to tow trailer loads of billets could not maneuver in front of the furnaces.

**Truck operator helps charge furnace after bringing loaded truck into position**

As each billet weighs 135 lb, man handling would have been undesirable. Also, manual operation would have added a considerable number of man-hours to the handling procedure and caused unnecessary delays. It would have been impossible to keep furnaces operating efficiently as new batches must be ready to load as soon as previous batches have been fired.

The 6000-lb, straight-frame burden carrier can be maneuvered to within a few feet of the furnace doors and unloaded directly into the furnace. As soon as the billets are unloaded, the carrier returns to the storage yard where overhead cranes reload it.

Maneuvering in the area adjacent to the furnace is no longer a problem as the burden carrier can be driven backward or forward and need not be turned around. To further improve its maneuverability, the truck is equipped with four-wheel steering apparatus. Raising the deck of the truck to 33½ in., the height of the furnace hearths, facilitates unloading of billets. *From a release of Mercury Manufacturing Co., Chicago, Ill.*

# Puzzled about getting the Right Explosion-Proof Lighting Equipment?

## Only Crouse-Hinds has everything you need

### ...in every class ...in every group!

For *complete* protection when making lighting installations in hazardous locations you need more than explosion-proof or dust-tight lighting fixtures. You also need UL-listed explosion-proof switches, junctions, fixture supports, unions and seals.

Crouse-Hinds now offers a broad selection of Condulet* explosion-proof lighting equipment for Class I, Groups A and B locations. In fact, you can specify complete Crouse-Hinds explosion-proof lighting installations, all UL-listed, *no matter what class or group of Article 500 of the National Electrical Code is involved.*

The same holds true for the entire Crouse-Hinds Condulet line of more than 15,000 conventional and explosion-proof items. With the broadest line in the field, Crouse-Hinds recommends *exactly* what you need . . . and *only* what you need.

A nearby Crouse-Hinds distributor will be glad to discuss your explosion-proofing problems and make recommendations without obligation.

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For more facts circle 524 on Reply Card

# PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

With the new setup, it is the distance between shaper blades, not the thickness of the board, that determines tenon thickness. Passing drawer-bottom pieces through the machine is more than twice as fast as work on the single blade machine and tenons fit exactly into the grooves made in drawer sides. *From a release of Rockwell Mfg. Co., Pittsburgh, Pa.*

## Snow-Melting

INCLUSION of a wrought iron snow-melting system beneath a 7-ft wide sidewalk was an unusual feature at the time of its construction in 1946. The sidewalk was laid for 150 ft along the front of the administration building of the Dewey and Almy Chemical Co. Although it has a northern exposure, never reached by winter sunshine, the sidewalk has remained clean, dry and safe during snowy weather for the past 10 winter seasons.

Oil-fired boilers in the power house provide heat for the snow-melting system. Waste steam from the building heating system return line is piped to a heat exchanger where 180 gal of a solution of water and permanent antifreeze is heated to 160 F. This solution is pumped through the grids of 1¼-in. wrought iron pipe buried in the concrete sidewalk.

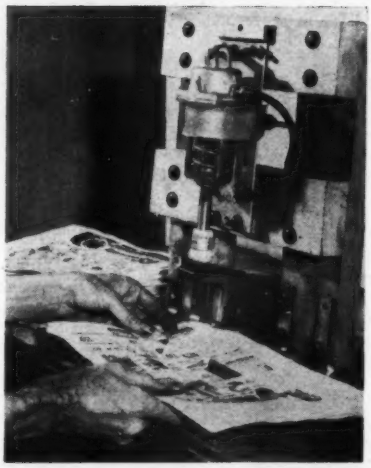
Cleaning costs are also kept to a minimum and snow and slush are not tracked into the reception lobby and office corridors. *From a release of A. M. Byers Co., Pittsburgh, Pa.*

## Improvised Power Stapler

AN AIR MOTOR, a discarded refrigerator compressor and a desk stapler were used to make an automatic stapling machine when the File-Ad Service, Chicago, Ill., had the job of stapling 170,000 pages of legal exhibits.

Working with a standard desk stapler that made its own staples, the operator was limited to a half-hour's work before becoming fatigued. During this period, 350 to 500 sheets of paper were handled for approximately 33 operations of the stapler.

To make a power stapler for handling the work, an electrical solenoid whose plunger would push down and operate the desk stapler, was tried. This failed because the action of the solenoid was too rapid and broke the staples before they could be fully formed.



**Improvised automatic stapler consists of desk stapler and pneumatic motor driven by a refrigerator compressor**

Next, a three-inch diaphragm-type motor which would operate on compressed air or hydraulic fluid, was mounted on a framework of two-by-fours. A one-third horsepower compressor from a discarded refrigerator was used to power the motor which was controlled by a foot switch. The stapler was held in place by screws, which could be removed to allow substitution of a numbering machine to be operated by the motor.

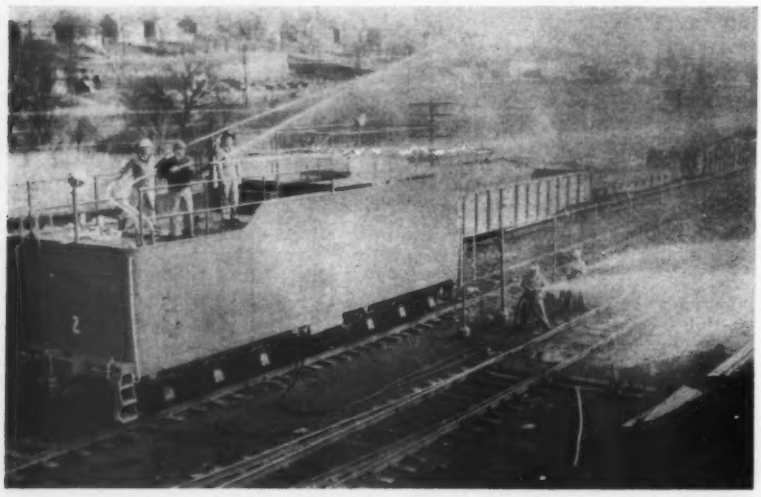
The gradual action of the motor, working on 20 psi, proved ideal for the stapling operation, enabling the operator to handle 1000 sheets of paper an hour. The job was completed in 10 days instead of an estimated 30. Total cost was $25.00. *From a release of Powers Regulator Co., Skokie, Ill.*

## Locomotive Tender Turns Fire Fighter in Steel Mill

A LOCOMOTIVE tender, converted into a water carrying tank, is ready to go into action to fight any outbreak of fire at an Illinois steel mill. It houses 15,000 gal of water and, fully loaded, weighs 121 tons.

Hose lines on each side of the pumper, four shorter ones on the top deck and a long range turret nozzle can be used for full operation. At such a time, full pressure can be maintained for 22 minutes. Under less severe conditions, working at reduced pressure, the pumper can operate for one hour.

The pumper, drawn by a diesel locomotive, rolls on standard gage track on two six-wheel trucks. *From Steelways, published by American Iron and Steel Institute, New York, N. Y.*



**Converted locomotive tender makes efficient, mobile fire fighting unit in steel mill**

## Noise Reduction Through Vibration Damping

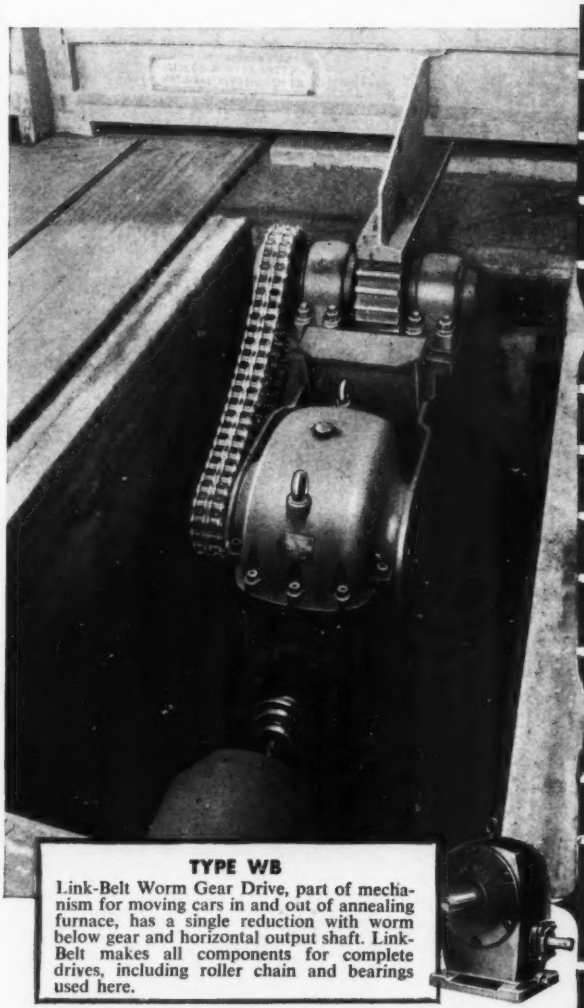
CHIPPING METAL from large marine propeller castings made of an alloy similar to bell bronze, created a noise problem in one shop. Several methods of reducing the noise were tried, including wooden blocks and props arranged to support the blades; steel weights and sandbags. All were unsuccessful.

Dampers, consisting of two, 6-in. steel disks, ½-in. thick, were tried as a solution to the noise problem. A clamp with large bearing faces is made by welding one disk to a bracket that contains a screw. Damping material is attached to the inner faces of the

*Arrange high-ratio speed reduction in least space from*

# these 4 and 15 more

## LINK-BELT Worm Gear Drives

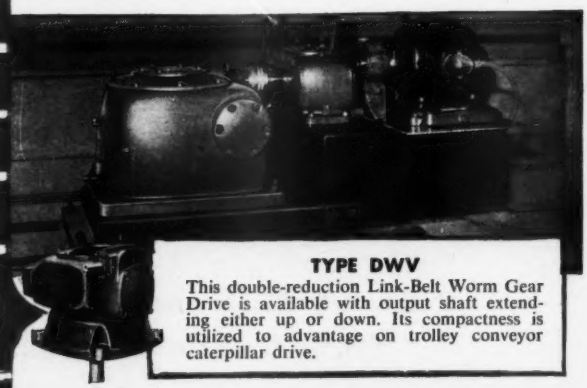


**TYPE WB**

Link-Belt Worm Gear Drive, part of mechanism for moving cars in and out of annealing furnace, has a single reduction with worm below gear and horizontal output shaft. Link-Belt makes all components for complete drives, including roller chain and bearings used here.

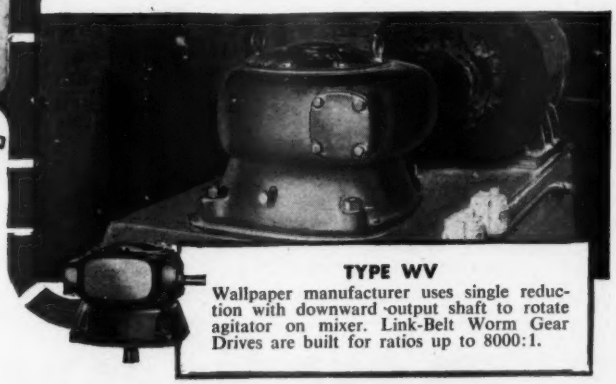
**TYPE HWB**

Consisting of a helical gear first reduction and worm gear final reduction, with worm below gear and horizontal output shaft, this drive helps power car haul in a steel mill.



**TYPE DWV**

This double-reduction Link-Belt Worm Gear Drive is available with output shaft extending either up or down. Its compactness is utilized to advantage on trolley conveyor caterpillar drive.



**TYPE WV**

Wallpaper manufacturer uses single reduction with downward output shaft to rotate agitator on mixer. Link-Belt Worm Gear Drives are built for ratios up to 8000:1.

ADD to basic compactness the application flexibility offered by 19 types — and you'll find the perfect mating of speed and need in the complete Link-Belt line of Worm Gear Drives. For selection guidance and full data, ask your nearest Link-Belt office for copy of 80-page Book 2324-A.

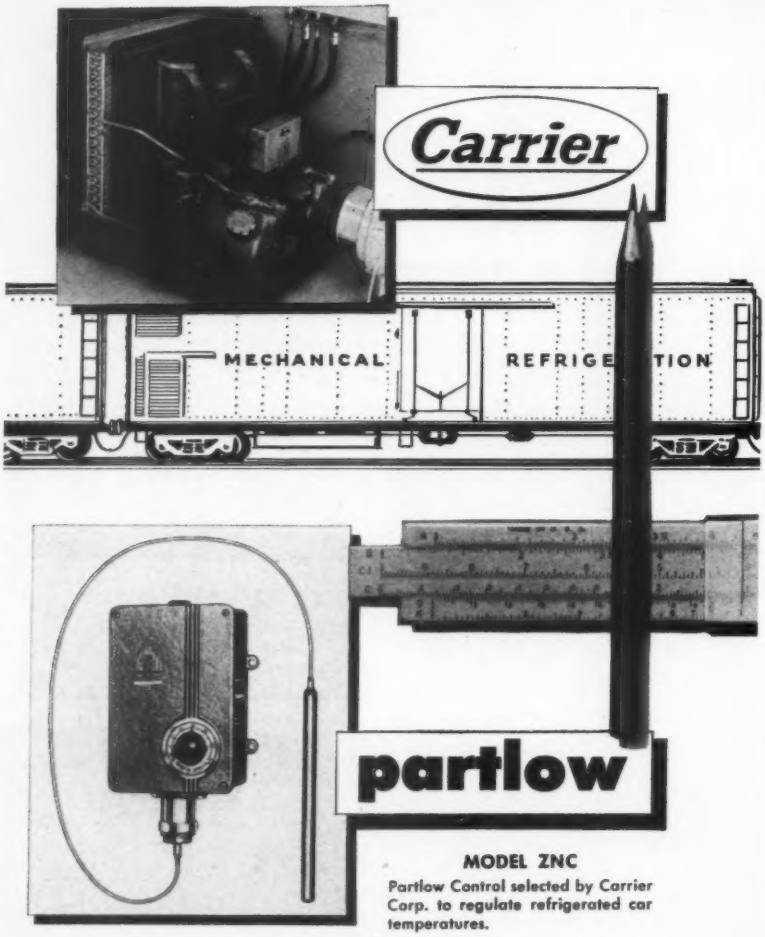
LINK-BELT

ENCLOSED DRIVES

14,307

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

**For more facts circle 525 on Reply Card**




MODEL ZNC
Partlow Control selected by Carrier Corp. to regulate refrigerated car temperatures.

## Partlow Controls help Carrier Railway Refrigeration Units "think for themselves"

Carrier Railway Refrigeration Units that "think for themselves" are setting a new standard for positive, controlled temperature in rail transportation of frozen foods. *And Partlow Controls call the signals that keep temperatures on the button!*

The Carrier systems are designed to heat as well as cool, providing a constant temperature despite the various climate changes encountered in transcontinental runs. A car temperature range from –10°F to 70°F is possible, depending on the Partlow Control setting.

What's your temperature control problem? Tell it to Partlow! There's a Partlow Control to fit your requirements . . . in the range from –30°F to 1200°F. For use with gas, oil, steam or water valves; or electrical equipment.

SEND FOR CONDENSED CATALOG

**partlow**

the pioneer in mercury thermal controls

THE PARTLOW CORPORATION, Dept. PE-157, New Hartford, N.Y.
Offices in All Principal Cities

NO MATTER WHAT YOU MAKE, PARTLOW CONTROLS WILL HELP MAKE IT BETTER
For more facts circle 526 on Reply Card

# PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

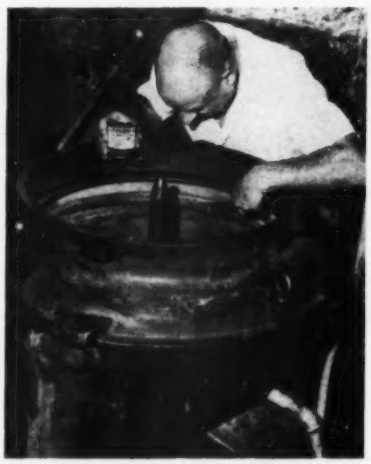
steel disks and, when the damper is attached to the propeller blade, it is pressed against the blade surface. When the blade vibrates, the heavy clamp does not follow the vibration of the blade because of inertia and the resilience of the damping material.

Most satisfactory results have been obtained with an asphalt-impregnated felt, of the type used in automobile bodies. An improved design in the damper called for welding two 6-in. square steel plates, to the jaws of a 6-in. C clamp.

Several of these dampers are attached to the blade being chipped. The noise reduction is significant, but greater reduction could be obtained through further damping. It is possible to reduce, through the use of vibration dampers, chipping noise to the point where the chipping tool itself is responsible for remaining noise. *From an article by James H. Botsford, Bethlehem Steel Co., in Bureau of Ships Journal, published by Department of the Navy, Washington, D. C.*

## "Plastic Steel" Mends Machines

A CYLINDER on a hydraulic press and a large centrifuge are two pieces



**Centrifuge is repaired with plastic steel**

of plant equipment that were repaired with a mixture containing 80 per cent steel and 20 per cent plastic.

The cylinder was on a 3000-ton hydraulic press at the Chrysler Corp., Detroit, Mich. By using the steel-plastic mixture to repair the break, $25,000 and 60 days of production time were saved.

Approximately $1000 and several

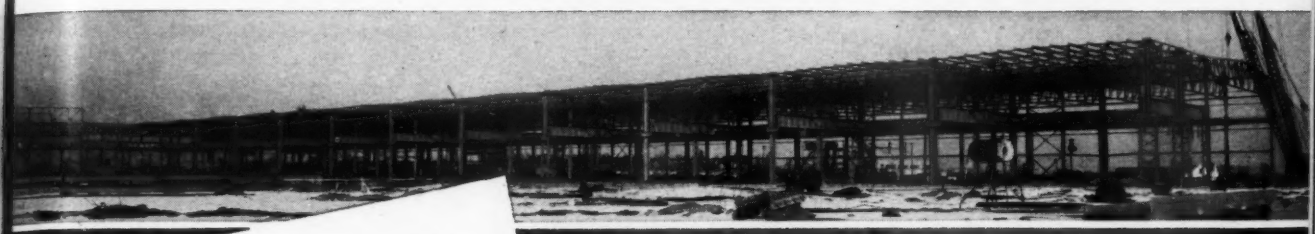


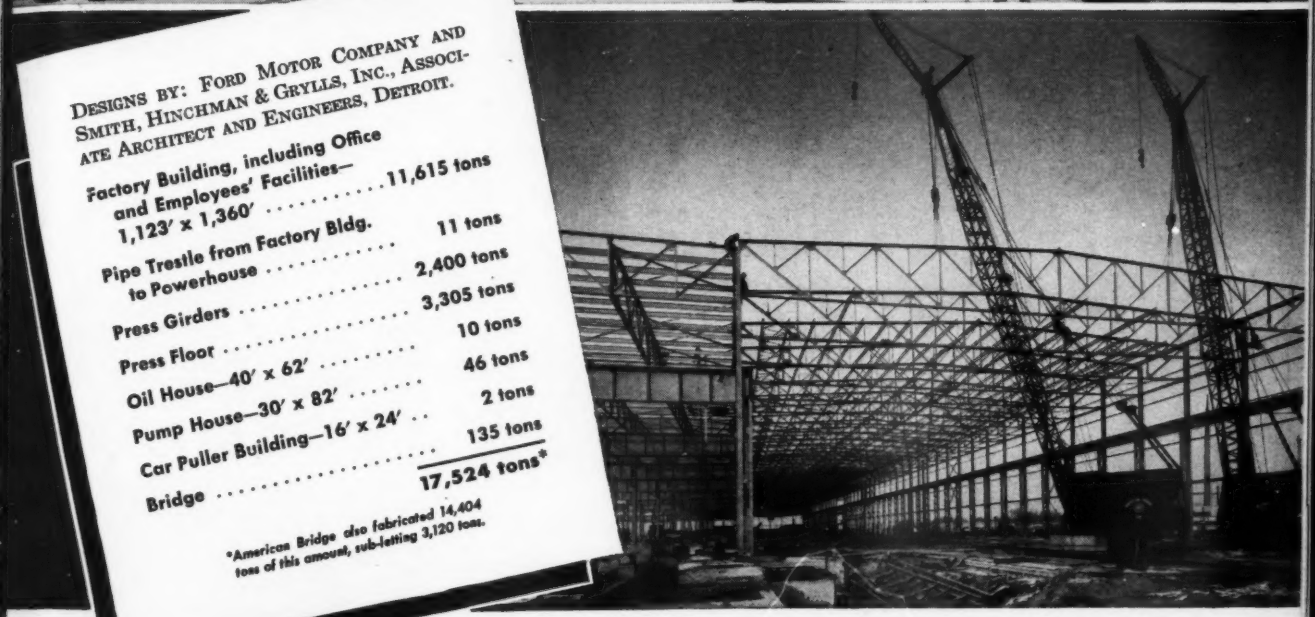
For more facts circle 527 on Reply Card——→

# AMERICAN BRIDGE

## *erects 17,524 tons of steelwork in just 4 months*

## *for* FORD'S NEW METAL STAMPING PLANT





DESIGNS BY: FORD MOTOR COMPANY AND SMITH, HINCHMAN & GRYLLS, INC., ASSOCIATE ARCHITECT AND ENGINEERS, DETROIT.

| | |
|---|---|
| Factory Building, including Office and Employees' Facilities—1,123′ x 1,360′ | 11,615 tons |
| Pipe Trestle from Factory Bldg. to Powerhouse | 11 tons |
| Press Girders | 2,400 tons |
| Press Floor | 3,305 tons |
| Oil House—40′ x 62′ | 10 tons |
| Pump House—30′ x 82′ | 46 tons |
| Car Puller Building—16′ x 24′ | 2 tons |
| Bridge | 135 tons |
| | 17,524 tons* |

*American Bridge also fabricated 14,404 tons of this amount, sub-letting 3,120 tons.

**BOLTED—All field connections on this job were made with high tensile and ordinary bolts.**

Ford's fourth and newest metal stamping plant above is another job by American Bridge.

Located near Chicago Heights, about 25 miles from the Loop, the new plant is as modern as you'll find anywhere. The mammoth steel frame main building is 1123′ wide by 1360′ long and provides 1,700,000 square feet of floor space, for offices, employee facilities, and the factory.

The plant is designed to accommodate 22 major and 21 intermediate lines of giant 50- to 1,000-ton presses. When full production is reached, the plant will employ approximately 4,000 people and turn out upwards of 160 freight-car loads of automobile body stampings per day.

17,524 tons of structural steel went into the vast building. American Bridge fabricated 14,404 tons and erected the entire 17,524 tons. In the panel above is listed the tonnage used in the project. All field connections were made with high tensile and ordinary bolts.

If you would like to know more about the advantages of having American Bridge fabricate and erect the structural steel work for your expanding industrial facilities, just contact our nearest office.

**AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION • GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.**

Contracting Offices in: AMBRIDGE • ATLANTA • BALTIMORE • BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • ELMIRA • GARY HOUSTON • LOS ANGELES • MEMPHIS • MINNEAPOLIS • NEW YORK • ORANGE, TEXAS • PHILADELPHIA • PITTSBURGH • PORTLAND, ORE. • ROANOKE • ST. LOUIS • SAN FRANCISCO • TRENTON

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

# AMERICAN BRIDGE

USS

**INTERESTING MOTION PICTURES AVAILABLE**—"Building for the Nations" and "The Suspension Bridge," two entertaining and educational films, now available without charge to businesses, fraternal and civic organizations, churches, schools and colleges. Write to Pittsburgh office for bookings.

UNITED STATES STEEL

# New QUAKER hose for hot air ducting cuts heat loss up to 57%

OUTSIDE JACKET SURFACE TEMPERATURE (DOUBLE JACKET) 170°F.
OUTSIDE JACKET SURFACE TEMPERATURE (SINGLE JACKET) 235°F.
INSIDE AIR TEMPERATURE 450°F.

## Synthetic fabric jacket and silicone tube retain temperatures from upstream to downstream end

Made in continuous lengths up to 50′, this new Quaker hose easily withstands temperatures as high as +450°F; as low as −80°F.

As the above diagram shows, the hose keeps heat loss—and therefore energy loss—to a minimum. (Comparable outside temperature of ordinary hot air ducting material, such as stainless steel, would be about 400° F.). Both the silicone tube and the synthetic fabric jacket of Quaker's new hose hold the heat!

Other advantages? The hose is lightweight and fully flexible. And it resists abrasion.

Available in either single or double jacket, the hose comes in 1″ to 4″ I.D.'s. Sizes 1″ and 1¼″ I.D. can be made in 30′ continuous lengths; 1½″ to 4″ I.D. in 50′ lengths. The hose takes regular expansion and shank hose couplings.

**Want more information? Write to:** ***H. K. Porter Company, Inc. Quaker Rubber Division, Philadelphia 24, Pa. or Quaker Pioneer Rubber Division, Pittsburg, Cal.***

**HKP** QUAKER RUBBER DIVISION
QUAKER PIONEER RUBBER DIVISION
H. K. PORTER COMPANY, INC.

**For more facts circle 528 on Reply Card**


# PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

days of downtime were saved when the Marriner Combing Co. repaired a large centrifuge with similar material.

Used with a hardener, the material is applied to the metal, without pressure or heat. After hardening, a process taking about two hours, it can be machined like metal. *From a release of Devcon Corp., Danvers, Mass.*

## Hardwood Floor Damaged by Water Repaired, Returned to Use

DURING VACATION time at Midvale Elementary School, Madison, Wis., when the school was closed and not under usual observation, part of the roof above the gymnasium developed a leak, allowing rain water to drip onto the hardwood floor. The water caused swelling in the wood strips which was sufficient to break the bond between the strips and the underlying corkboard, causing severe buckling at three locations.

**At its worst, bulge caused by water was one-third as high again as seen here**

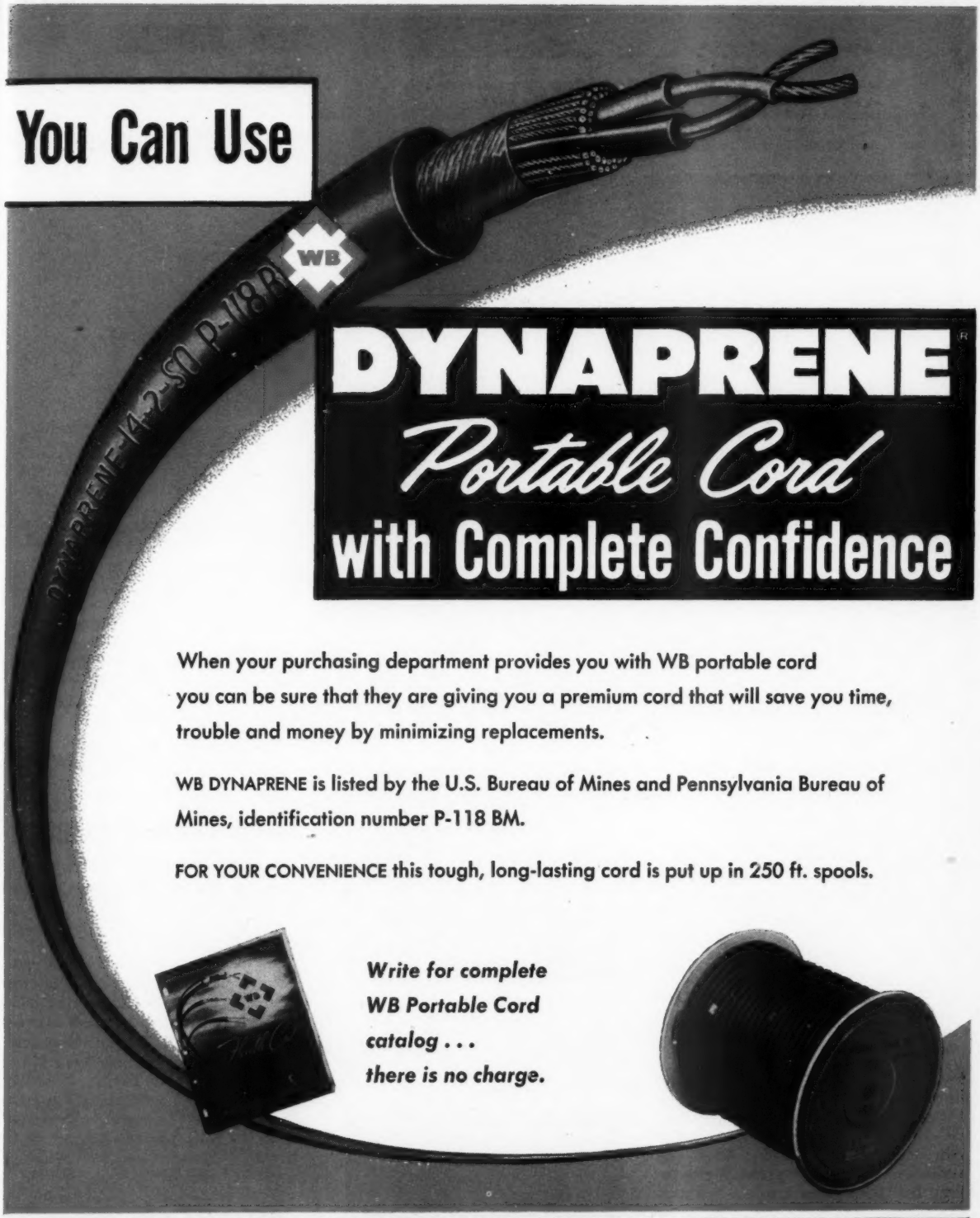
**Remedial measures included infrared heat, ventilation and imposed loading**

Two of the three bulges, showing a maximum elevation of 2½ in. were eliminated by heating the gymnasium to 84 F for one day, followed by heating at 94 F for another day.

To reduce the third bulge, which reached a total elevation of nine inches, two bags of shot and sand, totalling 1750 lb, were placed on it and six, 250-watt, infrared heat lamps were directed at the bulge to hasten drying.

On the following day, a consider-

# You Can Use




# DYNAPRENE®

## *Portable Cord*

## with Complete Confidence

When your purchasing department provides you with WB portable cord you can be sure that they are giving you a premium cord that will save you time, trouble and money by minimizing replacements.

WB DYNAPRENE is listed by the U.S. Bureau of Mines and Pennsylvania Bureau of Mines, identification number P-118 BM.

FOR YOUR CONVENIENCE this tough, long-lasting cord is put up in 250 ft. spools.

***Write for complete WB Portable Cord catalog . . . there is no charge.***

Well Built Wires Since 1899

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WHITNEY BLAKE COMPANY

NEW HAVEN 14, CONNECTICUT

**For more facts circle 529 on Reply Card**

Schramm Model 105 Air Compressor and Direct Drive Motor are mounted on overhead beams at the plant of the High Welding Co., Lancaster, Pa. Assembled rigidly and in perfect alignment, compressor and motor take up only a fraction of the space required by other makes and designs. Unit provides 105 cfm of free air for operating hand grinders and chipping hammers.

**WELDING COMPANY DISCOVERS:**

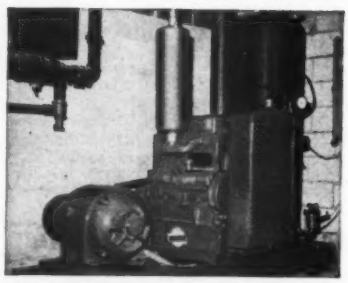
## Schramm Compressor saves floor space . . . needs no foundation at all

High Welding Co., Lancaster, Pa., saves floor space by perching its Schramm 105 Air Compressor on overhead beams. That's easy because Schramm Industrial Compressors are vibration-free—need no special foundations. And no compressor is more compact.

Besides saving space, Schramm Compressors offer features found in no other machine. Schramm units of all sizes produce full rated capacity at the tool. Balanced reciprocating parts eliminate vibration and cut down wear on bearings. And Schramm engineered cooling systems permit continuous operation without danger of over-heating.

**Schramm manufactures a complete line of air compressors and accessories for all industrial uses. Catalog GC-55 describes our Small Industrial Air Compressors, Catalog 5510 our Industrial Air Compressors. Write today for your free copies—without obligation.**

*Your local Schramm Dealer is listed in the Yellow Pages of your telephone directory.*



**Jacketed Liquid Cooling System.** Units delivering 85 cfm of air and over are jacketed for liquid cooling. Units delivering 50 cfm of air or less are equipped with air blast. Both provide adequate cooling for full load, permitting continuous operation.

**No Foundation Needed.** Balanced reciprocating parts in Schramm industrial compressors assure vibrationless operation and permit installation without expensive foundations. Schramm units can be set up in almost any out-of-the-way location.

**Schramm, Inc.**

MANUFACTURERS OF AIR COMPRESSORS

665 North Garfield Ave. West Chester, Pa.

**For more facts circle 530 on Reply Card**


# PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

able amount of water was found under the flooring. A ⅝-in. hole was drilled in the floor and a conical metal connection was made to this hole and to a 1-hp, heavy-duty, vacuum cleaner. With this equipment, a little less than two gallons of water was pumped from under the floor.

Six large vacuum cleaners were then connected to holes drilled in the floor and air, heated to 125F, was blown into the holes. It was exhausted through additional holes.

Four days later the load on the bulge was increased to 2200 lb, and upon removing the load on the following day, the bulge had been reduced to ¾ in. Nearly a week later use of the gymnasium was resumed.

During the forced drying operation the six infrared lamps were in service for an average of 188 hr each and the six vacuum cleaners for an average time of 46 hr each.

Since the asphalt mastic used in the original floor installation bonds under traffic, and since the hot air used to dry out the floor would assist bonding, no attempt was made to add new mastic as the floor returned to normal. *From a release of Forest Products Laboratory, U. S. Dept. of Agriculture, Madison, Wis.*

## Insulation Fights Condensation

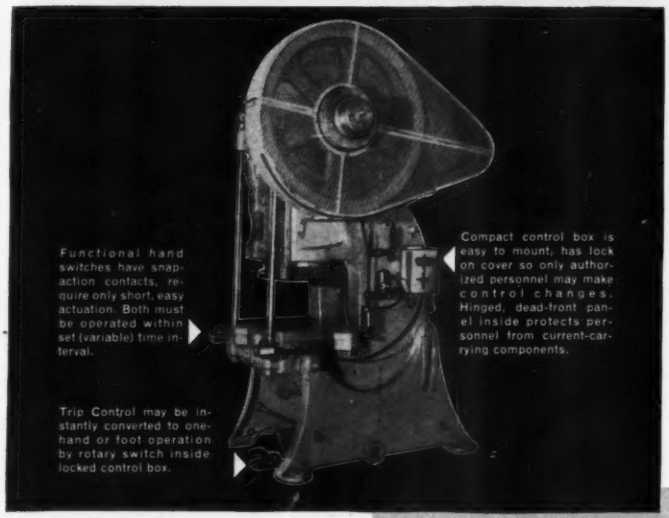
ONE PROBLEM arising from the maintenance of high temperature and high humidity in a textile weaving room, is damage to walls and ceiling by condensation.

In the new, one-story weave room at the Clinton Cotton Mills Clinton, S. C., plant, a two-inch layer of cellular glass insulation installed between the outside face brick and the interior glazed tile wall. Two-inch thick blocks laid in hot asphalt over a three-inch wood deck and covered with a four-ply built-up roof covered with gravel, form the roof. The insulating material forms a moisture-vapor barrier on walls and ceiling.

Four evaporative cooling units, installed in roof pent houses and each with a capacity of 80,000 cfm, are designed to handle a heat load of 5,000,000 Btu per hour.

The complete system provides optimum air conditions for the weave room so that throughout the 121,000 sq ft of production area, temperature shows little variance from the 80 F to 85 F range and relative humidity is

# MICRO SWITCH . . . FIRST IN PRECISION SWITCHING


Functional hand switches have snap-action contacts, require only short, easy actuation. Both must be operated within set (variable) time interval.
Compact control box is easy to mount, has lock on cover so only authorized personnel may make control changes. Hinged, dead-front panel inside protects personnel from current-carrying components.
Trip Control may be instantly converted to one-hand or foot operation by rotary switch inside locked control box.

## MICRO SWITCH TRIP CONTROLS

**for more PRODUCTION with increased Safety**

**MICRO SWITCH Trip Controls have wide range of uses**

These controls offer a choice of desirable single stroke control for positive mechanical clutch machines and automatic cycling control for friction clutches and hydraulic and pneumatic equipment.

**FOR SMALL PRESSES**

Provides faster, safer operation with less effort of small two-hand presses, riveting machines, etc.

**FOR PAPER CUTTERS**

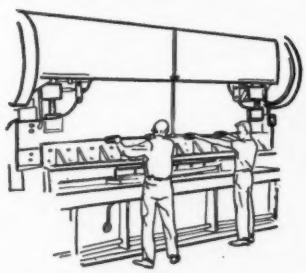
Complete protection is afforded operator in cutting or trimming either flat stock or labels.

**WIDE VARIETY OF PRESS CONTROL METHODS AVAILABLE**

1. One operator—two hands.
2. One operator—two hands or one foot.
3. One operator—two hands or either hand or one foot.
4. Two operators—one to four hands, any combination, or one foot.
5. Three operators—one to six hands, any combination, or one foot.
6. More than six hands, any combination, or one foot.

**INCREASED PRODUCTION with INCREASED SAFETY**

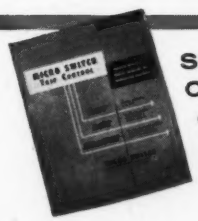
- Instant electrical response
- Feather-touch operation
- Easy control changes
- Decreased operator fatigue
- Two hand operation
- Cannot be "cheated"
- Interlock prevents power stroke while changing dies



**FOR USE ON LARGE PRESSES**

Makes operation of large presses and press brakes safe and less tiring. Any number of operator stations may be "wired into" the control circuit.

***Let us send you complete information on* MICRO SWITCH *Trip Control and the name of the distributor nearest you.***




**SEND FOR CATALOG 65 TODAY**

**Gives complete description of all controls and clutch actuating equipment.**

**MICRO SWITCH**

**A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY**

*In Canada, Leaside, Toronto 17, Ontario* • **FREEPORT, ILLINOIS**

**For more facts circle 531 on Reply Card**

New fan combines power with quietness

# R&M-Hunter "Q" Type Fan

**For plants, offices, schools, stores, laboratories, restaurants**

- Totally enclosed single phase permanent split capacitor motor.
- One-piece cast aluminum propeller in modern airfoil design.
- Easily installed heavy steel frame with high-efficiency entrance ring.
- Certified air deliveries from 2900 to 10800 CFM.
- Backed by two of the oldest and best known names in ventilating fans.
- Direct drive eliminates horsepower loss from belt friction.

Write for complete data and prices

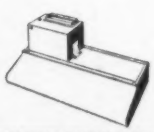
R&M HUNTER

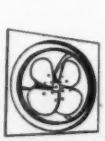
**HUNTER DIVISION — ROBBINS & MYERS, INC.**
2436 Frisco Ave., Memphis 14, Tenn.
*Manufacturers of a complete line of fans for industrial, commercial and residential service.*

ATTIC FANS

AIRSPREAD FANS

CEILING FANS


KITCHEN RANGE HOOD


EXHAUST FANS

**For more facts circle 532 on Reply Card**

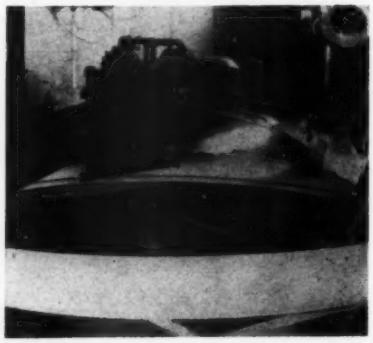
# PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

held almost constant at 80 per cent. *From a release of Pittsburgh Corning Corp., Pittsburgh, Pa.*

## Polyethylene-Powder Coating

EXHAUST FANS and housings made of mild steel and each weighing almost two tons, were coated with a non-porous layer of modified, polyethylene powder to make the equipment corrosion resistant.



**Ventilator section of exhaust system is spray-coated with polyethylene powder**

**Fan housing and rotor have been given corrosion resistant coating of powder**

The non-porous layer consisted of finely divided polyethylene powder blended with moisture-resistant elements to prevent balling and lumping and to increase the properties of free flow, adhesion and weather resistance.

To coat the housings, fan blades and rotors, the surfaces were first sand-blasted and pre-heated, then the fluidized powder was applied.

The coating was applied at the rate of 10 sq ft per hour over approximately 425 sq ft of each unit. The preheated steel will withstand, under optimum conditions, a direct tensile pull of 1000 psi. *From a release of American Agile Corp., Cleveland, O.*

# GUESS WHO DIDN'T SPECIFY MONARCH INDUSTRIAL SOLID TIRES

Have another bite, Dimbulb! You said you'd "eat" this tire if it didn't outlast a MONARCH!

*Have a heart, boss! That was only a figure of speech!*

G'wan . . . eat! That "figure of speech" cost us plenty! We've replaced too many solid tires lately!

*But I thought all solid tires were the same!*

Dimbulb, we need results . . . not excuses and high replacement costs! We can't afford premature tire failures. That's why I told you to get MONARCH solids. They last longer!

*Then they must cost more! How do we save if we have to pay a premium?*

There's no premium for MONARCH tires! They cost no more than other brands. But . . . they do give more mileage per dollar because they are made by specialists and modern equipment from the finest raw materials available. Users' records as well as fatigue tests prove they are best!

*I'll buy that! And I'll call the local MONARCH dealer today for prices.*

*Why don't you check the Yellow Pages for your nearest Monarch dealer? Ask him, or write direct, for our new 16-page CATALOG MR-457. It's full of facts, specifications and suggestions to help you save more on solid tires.*

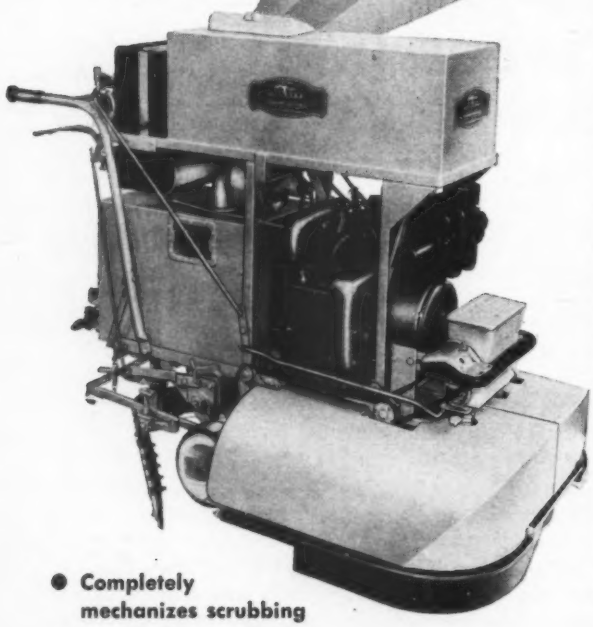
THE MONARCH RUBBER COMPANY
453 LINCOLN PARK • HARTVILLE, OHIO
• 7-255 General Motors Bldg., Detroit, Mich.
• 1035 Bartlett Street, Hayward, Calif.

1318-MR

For more facts circle 533 on Reply Card

# Self-Powered
# COMBINATION SCRUBBER-VAC
# Cleans Vast-Area Floors "By the Mile"

Monoxide Eliminator, Powder Dispenser, and Rinse Assembly are accessories



- Completely mechanizes scrubbing
- Coverage up to 24,400 sq. ft. per hour!
- Mounts a SELF-STARTING gasoline engine

This *all-in-one* cleaning unit, *Finnell's 218G Gasoline-Powered Combination Scrubber-Vac,* is indeed the answer to today's need for increasing output per man-hour on vast-area scrubbing. *The 218G completely mechanizes scrubbing* — applies the cleanser, scrubs, flush-rinses if required, and picks up (damp-dries the floor) — *all in one operation!* Independence from power lines permits the machine to go wherever the operator guides it... working in and out of production areas with ease ... *scrubbing continuously.*

Maintenance men appreciate the labor-saving features of this unit. The gasoline engine starts quickly and easily by pressing the starter button. And there are no switches to set for *fast* or *slow* — slight pressure of the hand on clutch lever adjusts speed to desired rate (up to 136 fpm). Two 18-inch brushes give a 36-inch scrubbing surface. *One engine* (2 cyl., 4 cycle, up to 10.1 hp maximum, and air-cooled) operates all working parts. The powerful vac performs quietly.

Whatever the area of your floors, find out what *you* would save with a *Combination Scrubber-Vac. Finnell* makes *self-powered* models, gasoline or propane operated, in 18, 30, and 36-inch sizes, and also *electric* models in sizes to meet specific needs. It's good to know too that *a Finnell Floor Specialist and Engineer is nearby* to help train your maintenance operators in the proper use of *Finnell Equipment* and to make periodic check-ups. For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 5301 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

**FINNELL SYSTEM, INC.**

*Originators of Power Scrubbing and Polishing Machines.*

Everything FINNELL for Floor Care

BRANCHES IN ALL PRINCIPAL CITIES

*See the Finnell Exhibit* • **PLANT MAINTENANCE & ENGINEERING SHOW** • **Cleveland** • **January 28-31** • *Space 423*

**For more facts circle 534 on Reply Card**

**CAN BE INSTALLED ANYWHERE.** Here workers begin to feed RoZone-RoSeal cable into conduit inside underground vault of St. John's Hospital. This versatile cable can be used anywhere—in the air, in conduit and ducts, direct in earth, even in water.

**EASY TO PULL.** Workers at the new St. John's Hospital in Tulsa draw Rome's easy-pulling high-voltage cable from underground switch vault to surface and power transformers. The hospital's architect recognized *all* the advantages of RoZone-RoSeal (see his letter below).

# Profit from this architect's experience with Rome's premium high-voltage cable

LEON B. SENTER, A.I.A.
ARCHITECT
306-7 PHILTOWER BLDG.
TULSA, OKLAHOMA

November 28, 1955

Regarding our choice of RoZone-RoSeal cable for St. John's Hospital:

We can tell you that due to the nature of the building, extreme reliability was the first consideration.

Closely following were the requirements of moisture resistance, inductive capacity in the configuration as laid, and uniformity of product.

We found that a specification built around Rome Cable's RoZone-RoSeal satisfied all the above.

Very truly yours,

LEON B. SENTER, A.I.A.

John C. Penafeather

John C. Penafeather
Mechanical Engineer

JCP:lz

He wanted the same things you probably want in a high-voltage cable: reliability, moisture resistance, the right electrical characteristics, and uniformity. He found them all in Rome Cable's RoZone-RoSeal.

You can use this cable anywhere—in the air, in conduit and ducts, buried in earth, *even in water*. Here's how it compares with most conventional thermosetting nonmetallic cables:

- Costs less.
- Greater resistance to moisture and comparable resistance to abrasion, crushing, impact, chemicals, and oils. oils.
- Easier pulling and bending. The RoSeal (polyethylene) jacket has a lower coefficient of friction than any other jacket material. And it bends easily at temperatures as low as −40° C.
- High corona levels on power cables.

Rome Cable's RoZone-RoSeal met this architect's rigid specifications, and it can meet yours, too.

**Specify RoZone-RoSeal for your next job.** Contact your nearest Rome Cable representative for more information—or write to Department 702 and ask for Bulletin ROT-1. Rome Cable Corporation, Rome, New York.

**ROME CABLE**
CORPORATION

**For more facts circle 535 on Reply Card**

# FAMOUS NAMES *ride on* WISSCO

## *Stamford Rolling Mills Co.*

*The story of Wissco Belts is best told by their users.* Here's what Thomas E. Downey, Jr., purchasing head of Stamford Rolling Mills says:

**"We are delighted with Wissco Belts. They have made our operation more efficient and economical."**

"Delighted with Wissco Belts"—and rightly so! A major step in Stamford's operation of casting and rolling brass into thin sheets (used in fabricating heat exchangers, radiators, and the like) is annealing coils of sheet brass. Prior to 1949, these coils were conveyed through the annealing furnace on powered steel rollers. Unfortunately, this conveying system was found to have some big drawbacks. For example, the great weight of the coils (460 pounds apiece) would cause them to slip down between the rollers and lock there. These jams, occurring 15 to 20 times a year, resulted in the loss of thousands of production hours while the furnace was being cooled and the jams cleared. A second drawback was that the coil edges were frequently battered by the rollers.

These continuing problems led Stamford to investigate using steel processing belts. But several belt manufacturers shied away from the job because of the very heavy loads and high temperatures involved. Stamford specified that

The loading end of Stamford's annealing furnace. Here, Wissco Belts carry heavy brass coils through the furnace at temperatures up to 1300° F.

# BELTS

## *Springdale, Conn.*

each belt must be capable of conveying 120 coils at a time—a total weight of 55,000 pounds. The belts were also required to resist annealing temperatures up to 1300° F. Finally, Stamford put Wickwire to work on their problems. The highly satisfactory result—Wickwire's engineers designed a special steel belt, with an unusually durable construction and a high nickel-chrome heat-resisting alloy content. These Wissco Belts are now in operation at Stamford, giving completely satisfactory service. Coil jamming and edge battering have been entirely eliminated. Thus, *Wissco Belts have totally solved another* tough processing job.

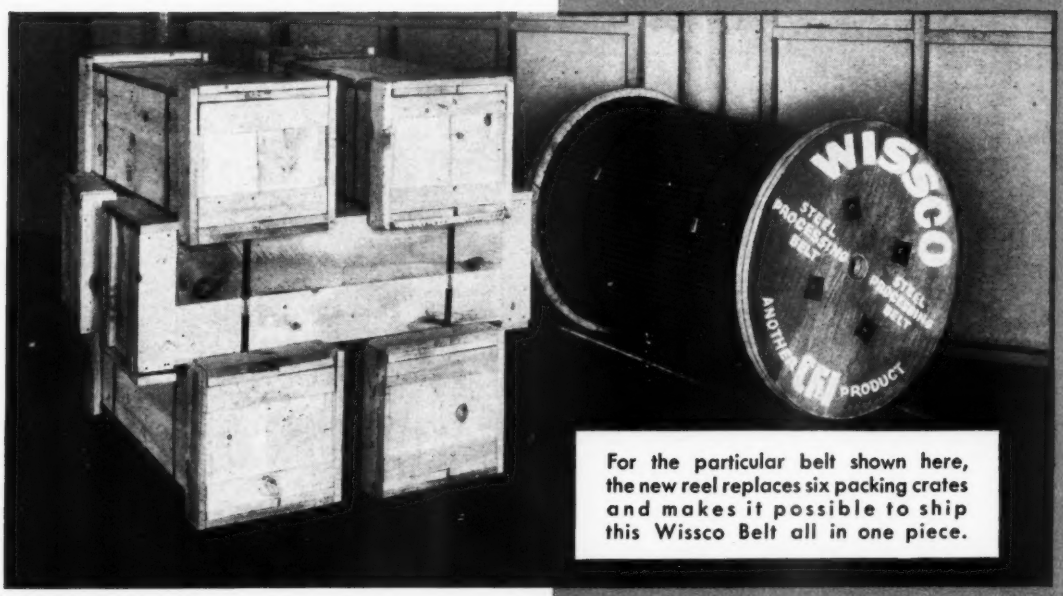
## "WISSCO REELS CUT OUR BELT INSTALLATION TIME IN HALF . . ."

. . . says Mr. Mastroianni, Stamford's Plant Engineer. "We particularly like the new method of shipping Wissco Belts on reels instead of in several smaller sections. Now, when replacing a belt, we simply jack the reel up on a spindle and let the old belt pull the new one through the furnace. With the Wissco reels, we can install a new belt in 4 hours where it used to take us 8."

The new Wissco Belt reels can help simplify *your* installation job, too. There's no more piecing a belt together which arrived in as many as 20 different crates . . . no more installing sections "wrong-end-to" or upside down.

What's more, these Wissco Belts on the new reels save you big money. Freight, storage and installation costs are lower . . . equipment down-time is shorter. And there's *no charge for the reel*—it's yours to keep!

For the complete story on Wissco Belt reels—first in the industry—contact your Wickwire representative today.




For the particular belt shown here, the new reel replaces six packing crates and makes it possible to ship this Wissco Belt all in one piece.

**WISSCO BELTS**

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

THE COLORADO FUEL AND IRON CORPORATION • Denver and Oakland
WICKWIRE SPENCER STEEL DIVISION • Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia
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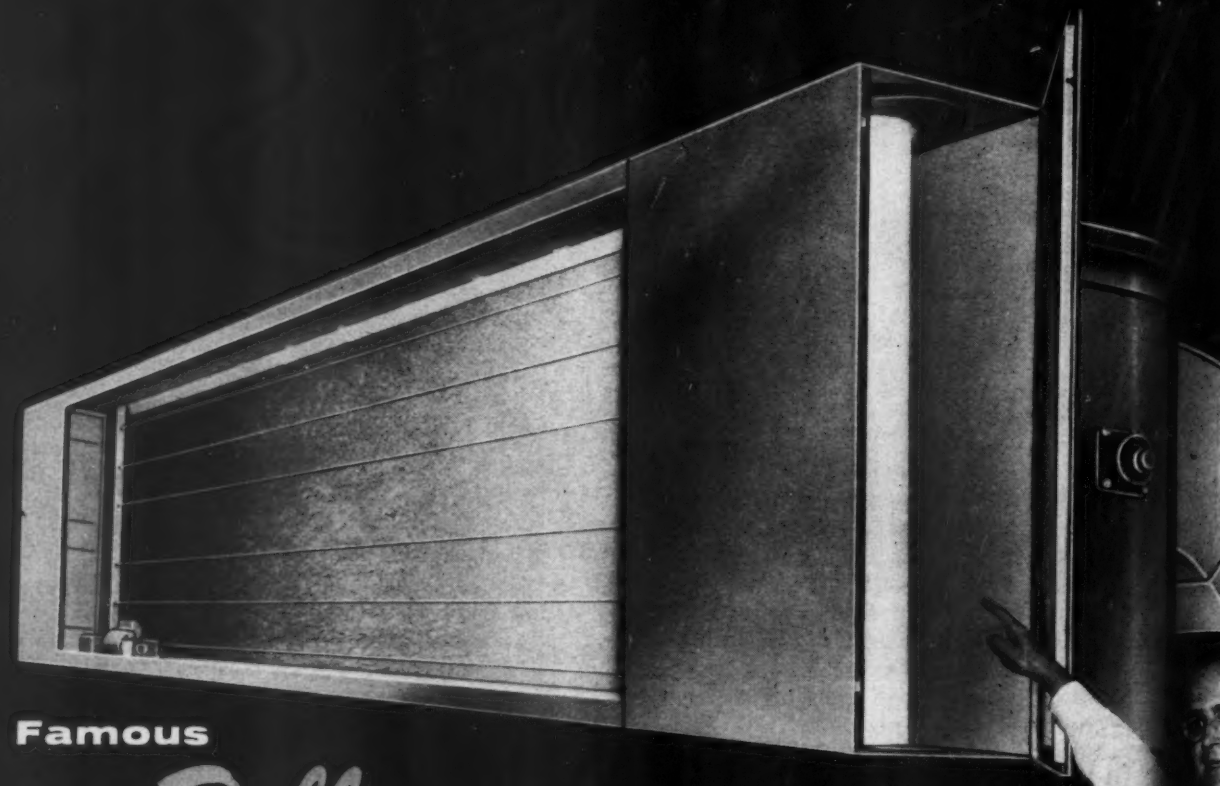
For more facts circle 536 on Reply Card



Famous

# AAF Roll-O-MATIC

## Air Filter Principle

Exclusive bonded glass fiber filter curtain — over 60 feet of highly resilient media available in compact rolls only 13" in diameter.

- One roll of media ... lasts up to a year
- Loads like a camera
- Each roll of media can do job of a year's supply of disposable filters at ½ the cost
- Nothing to touch ... not even a button
- Automatically renewable media

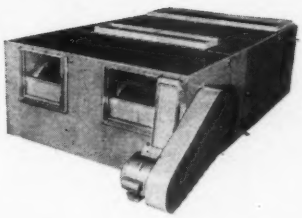
*See the Roll-O-Vent at Booths 38, 40 at the ASH&AE Convention in Chicago.*

# ...Announcing

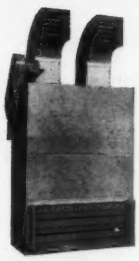
## New Herman Nelson

# Roll-O-Vent

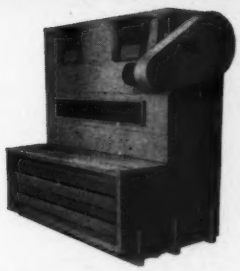
## Heating, Ventilating and Cooling Units that change their own filters



HERMAN NELSON ROLL-O-VENT HEATING AND VENTILATING UNIT



HERMAN NELSON ROLL-O-VENT INDUSTRIAL UNIT HEATER



HERMAN NELSON ROLL-O-VENT AIR CONDITIONING UNIT

It's new. It's completely automatic. It's the exclusive Roll-O-Matic Filter now available on these three popular Roll-O-Vent air handling units. You simply put the roll of media in the unit—and forget it—for up to a year. It does *all* the work *automatically*. Just look at the better filtering and savings advantages provided only by new Roll-O-Vent units:

**You save** on the costly, time-consuming job of periodic filter changes.

**You save** by gaining maximum filtering efficiency *all year 'round* — because media is automatically changed at just the right time.

**You save** because ROLL-O-MATIC roll media *costs only half as much as* disposable filters.

Only Herman Nelson Roll-O-Vent "packaged" heating, ventilating and cooling units offer you Roll-O-Matic Filtering—exclusive development of American Air Filter Company. Write for new catalog.

*Better Air Is Our Business*

AAF herman nelson

**American Air Filter**

COMPANY, INCORPORATED

228 Central Avenue • Louisville 8, Kentucky

For more facts circle 537 on Reply Card

# OPERATION AND PRODUCTION pointers for the industrial plant engineer

*Edited by H. E. B. Anderson*

## Fast Drilling Through Concrete

When a large U. S. Government quonset hut in Toulon, Ill. began truss-bursting at the seams from the weight of grain stored in it, heavier bolts and straps had to be installed at the floor level in order to keep the building sides from spreading.

The original straps and bolts were too light for the side-thrust load and as a result they were pulled loose at floor level. To get new anchorage, holes would have to be drilled through the reinforced concrete floor. The job called for the drilling of 250 6-in. diam. holes, 4 in. deep, so that the new anchors could be attached to the floor.

Anchor rods ⅝ in. thick had to be installed and concrete poured into the space around the anchor bolts in order to secure them.

The job was attempted with carbide drilling equipment.

A specially constructed rack was built on the rear of a farm tractor to operate the carbide drill. After drilling eight of the 250 holes, two carbide drills had been worn out or broken.

Another drilling method had to be found. Pneumatic or electric hammers were not feasible because the size of the hole required was 6 in. by 4 in. There would have been a break-out area requiring considerable patching.

**Diamond bits were used to drill 250 6-in. holes, in reinforced concrete**

Finally, a heavy motor and Truco diamond drilling bits, made by the Wheel Trueing Tool Co., Detroit, Mich., were selected. The unit was easily attached to the rack previously constructed for the carbide drilling equipment, although ordinarily the unit is mounted on rubber-tired wheels and can easily be moved by one man.

The Truco machine took three to four minutes drilling time per hole. Setup time was from four to five minutes per hole. Thus, a maximum of eight minutes was all that was necessary for actual drilling and setup time per hole. This allowed for the additional time required when the cores had to be knocked out.

Total drilling time was only 32 hr. The time consumption on the entire 250-hole job totaled just 64 hr.

It was found that the diamond drill bits averaged 83 holes per bit before resetting. At this point, two of the three bits were still giving fair cutting action but were retired to assure maximum salvage of diamonds for resetting.

## Plastic Spheres Control Fumes

Corrosive and noxious acid fumes from metal plating tanks are now being smothered under a blanket of hollow spheres molded of Bakelite polyethylene that resists almost indefinitely the acid solutions on which they float.

(Continued on page 58)

## Deep-Down Pipe Storage Increases Volume With No Increase In Floor Area

**Five-foot deep pits inside the plant provide extra storage for seamless pipe**

When in-plant storage space could not be expanded upward or outward because of overhead crane clearance requirements and floor space limitations, National Supply Co. solved the problem by digging into the ground in several locations in its Spang-Chalfant division plant in Ambridge, Pa. to give 40 per cent more storage.

More than 120,000 cu ft of additional space was provided for storing seamless pipe in four areas where concrete-lined pits, five feet deep, increased piling height to 13½ ft.

Pit storage was the best solution of the storage problem from the standpoints of cost and efficiency. The enlarged storage areas are as compact as before and thus permit increased production efficiency without plant expansion and without affecting handling methods. Separation of various types and sizes of oil well drill pipe, casing, tubing, and other pipe is provided conventionally by posts which are spaced to mark off 8-ft by 12-ft areas. Safety provisions will include a pipe fence at floor level and yellow post tops.

# QUICK! *"Call the Deluxe Dealer— we have a shelving problem!"*

There's a Deluxe Steel Shelving dealer nearby, ready to give on-the-spot shelving layout service. He will engineer efficient, flexible shelving installations and supply you with additional shelving racks as fast as you need them! Deluxe dealers are backed by the finest designed and sturdiest built shelving.

Only Deluxe combines *all* these steel shelving features:

1. One-piece bin type uprights—for greater rigidity, faster erection
2. Boltless adjustable shelf brackets—complete adjustability without tools
3. Snap-in dividers—for quick flexibility
4. Factory embedded shelf reinforcing—to cut down installation time
5. Coped shelf corners increase storage capacity

These features allow you to install Deluxe shelving at lowest cost.

DELUXE
STEEL SHELVING

Look for your Deluxe dealer under Shelving in the yellow pages of your telephone directory or write to the factory for the name of the dealer nearest you and the complete 56-page colorful "Shelving Reference Manual."

DELUXE METAL FURNITURE COMPANY • WARREN, PA.

*A Division of the Royal Metal Manufacturing Company*

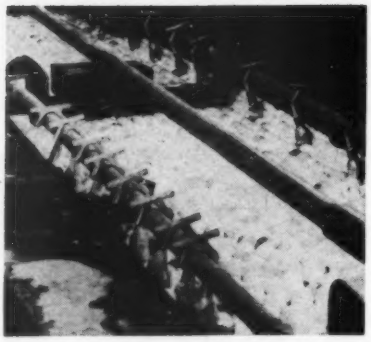
**For more facts circle 538 on Reply Card**

# OPERATION—PRODUCTION

(O and P begins on page 56)

Ordinarily, gas bubbles rise to the surface of metal plating solutions and burst, throwing a fine, corrosive mist into the air. Cosom Industries, Inc., Minneapolis, Minn., designed the hollow spheres of polyethylene to form an evenly-spread blanket over the surface of the liquid in the tank.

The spheres are about one and one-half inches in diameter; a size selected so that the spheres were not so small that they would lodge in recesses of the work spaces, nor so large that they left space between them when tightly packed. The spheres roll over one another when forced together and thus prevent "rafting" that would expose portions of the solution surface.



**Polyethylene spheres float on surface of plating bath to minimize fume escape**

A dense and even blanket requires about 55 spheres per square foot of surface area. While the spheres are used mainly to control acid fumes, they also help to maintain uniform plating bath temperature.

## Noise "Cornered" by Doors

FOLDING DOOR installation at the Central Mold and Machine Co., Akron, Ohio, has helped solve a noise control problem caused by a pneumatic coining machine, by reducing the noise an estimated 80 per cent.

Noise of operation of the machine formerly irritated both plant and office personnel, causing reduced efficiency. The machine was located in

(Continued on page 60)

## One Dual Drive Pump Provides Fire Protection at Gas Turbine Laboratory

INSTALLATION of a dual drive pump at the Thompson Products Gas Turbine Laboratory, Perry, Ohio, has provided the plant with a fire protection system that will provide 1500 gpm of water instantly to any part of the sprinkler system in the plant or fuel storage area.

The main water pumping station lies to the north of the plant on the shore of the lake. In the station there are three separate water pumping systems: a 1500 gpm fire-water pumping supply, a 3000 gpm cooling water supply, and a 200 gpm domestic and boiler water supply.

To provide instant discharge of large quantities of water in any part of the plant or fuel storage area, one Fairbanks-Morse 6-in. centrifugal fire pump, rated at 1500 gpm capacity, is used. This use of a single dual-driven pump as the only means of fire protection in the installation had the underwriters' approval and only alternate-power sources were provided.

The fire pump is driven either by a 150-hp drip-proof induction motor at 1750 rpm, or by a 170-hp diesel engine. The pump is direct-connected to the motor through a flexible coupling and to the diesel through a centrifugal clutch.

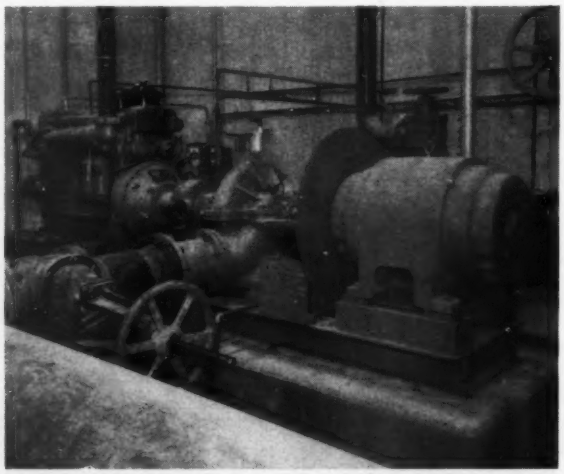
The fire pump installation is 7 ft below the lake surface and water flows to the pump under a positive head. The pump forces water 800 ft through a 10-in. pipe to a 10,500 gal fire-water storage tank at the main building site 65 ft above the pump level.

Water level in the tank is kept at 7,000 gal, two-thirds tank capacity. Compressed air fills the rest of the tank, keeping the water under a constant pressure of 125 psi, maintained by means of an automatically-controlled air compressor. A small motor-driven jockey pump, also automatically-controlled, keeps the water lines full and the level in the tank at 7,000 gal.

The fire water pumping system is automatically controlled by a three-part switch and timer. Any drop in water level immediately activates the jockey pump. If the demand is not quickly met, indicating that the sprinkler system has been called into operation, the 150-hp. F-M motor is activated, starting the big pump. Should the pressure continue to drop, due to an electric power failure, an automatic timing switch starts the diesel engine.

For starting the diesel there are two sets of batteries, each with its own charger. Each time the engine is activated, a different set of batteries is utilized. In the event the first set fails to perform, the other set automatically starts the engine.

**Pump house installation for main building and storage areas**



**Fire pump is direct-connected to an electric motor or diesel**

# They cut your costs for four big reasons!

## The complete Black & Decker line is POWER-BUILT to speed up your jobs!

Whatever Black & Decker Tool you buy, *this* you can be sure of: (1) It will be powered by the best electric motor in the business. (2) Its balance, compactness and lightweight mean easier handling. (3) It will be versatile, driving many accessories from among the 1,000 *plus* Black & Decker offers. (4) Its rugged construction means less down time, lower maintenance.

Those are the reasons why B&D Tools help you save time, cut costs, take the hard work out of tough jobs. And why industry has made Black & Decker the world's largest builder of portable electric tools!

See your B&D Distributor for details—or write for Catalog No. 10 to: THE BLACK & DECKER MFG. CO., Dept. 1501, Towson 4, Md. (In Canada: 80-86 Fleet St., E., Toronto 2, Ont.)

Look Under "TOOLS-ELECTRIC" in 'Yellow Pages'

(1) TAILORED POWER — Heart of every tool is a motor completely built by Black & Decker and tailored to the tool's specific needs.

(2) STREAMLINED BALANCE —Like this Scrugun®, all B&D Tools are designed for easier handling, less operator fatigue.

(3) TOP VERSATILITY — Typically, this Sander does a variety of jobs... sanding, grinding, wire brushing, buffing, wood planing.

(4) EXTRA RUGGED—This B&D Hammer, for example, handles the toughest jobs imaginable because it's *power-built* to last.

LEADING DISTRIBUTORS EVERYWHERE SELL

**Black & Decker®**

**Portable electric tools . . . *power-built to last!***

For more facts circle 539 on Reply Card

# dependable

## . . . or else!

Boiler Feed Pumps, like these four Warren Pumps shown at the new, ultra-modern North Grafton, Massachusetts, Heavy Press Forging plant of

**WYMAN GORDON COMPANY**

must always be available for round-the-clock operation—if and when necessary.

Photograph, courtesy Wyman Gordon Company. Other Warren Pumps in this plant include Condensate and Fuel Oil Transfer.

These experience-rated Warren Pumps, and thousands of others in the power plants of important and vital industries, are built with substantial plus factors as to dependability, low maintenance and economy.

BOILER FEED, CONDENSATE, FUEL OIL BURNER AND OIL TRANSFER SERVICE . . . there are types and sizes of Warren Pumps that will meet your requirements and live up to their reputation for dependability, minimum maintenance, economical operation and long life.

WARREN QUIMBY PUMPS

P-33

**WARREN PUMPS**

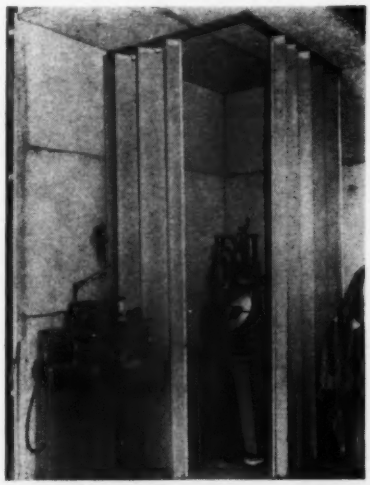
WARREN STEAM PUMP COMPANY, INC.

Warren, Massachusetts

For more facts circle 540 on Reply Card


# OPERATION—PRODUCTION

(O and P begins on page 56)



**Acoustical folding doors and insulation on walls and ceiling have cut noise from coining machine by 80 per cent**

one corner of the plant, with tile walls behind it and a steel roof deck overhead. There was no partition between the machine and the rest of the plant.

On the recommendation of an acoustical contractor, walls and ceiling in the immediate vicinity of the machine were insulated with a 3-in. layer of acoustical absorption material. Two Transwall doors, made by Transwall Coated Products Plant of Bemis Bros. Bag Co., Minneapolis, were installed as noise barriers between the coining machine and the plant.

The doors, one measuring 10 ft by 5 ft, the other 10 ft by 4 ft, are made of burlap coated with flame-resistant vinyl. The doors retract to a fraction of their extended length, allowing free movement of materials to the machine. Materials, including insulation, folding doors and tracks, cost $180.00. Plant personnel performed the labor.

## Carpet Handling Ram on Fork Truck

USE OF A RAM attachment on a fork truck at the Los Angeles warehouse of Bervens Carpet Corp. has reduced from six to two the number of men required for handling rolled carpeting from delivery trucks to storage racks.

Manual handling of the rolls has been eliminated almost completely, even in cutting operations. The truck ram can be held a foot or two off the floor, supporting a roll of carpet that is being unrolled for measuring and cutting.

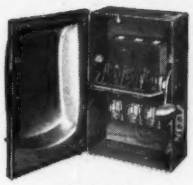
Attached to the fork plate of a Clark

# FIRST with a COMPLETE LINE OF SAFETY SWITCHES to meet the NEW NEMA STANDARDS

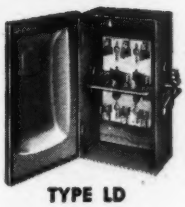
• The table below shows Square D switches meeting new industry specifications. Notice how they clarify conflicting features which existed under old designations. Notice, too, that they establish a new, heavy-duty industrial switch, Type HD.

One important thing which remains unchanged is the **DESIGN LEADERSHIP** which has made **SQUARE D SAFETY SWITCHES** industry's overwhelming **FIRST** choice for more than fifty years. Compare them, feature for feature. They cost no more, why settle for less?

**TYPE HD**



**TYPE ND**



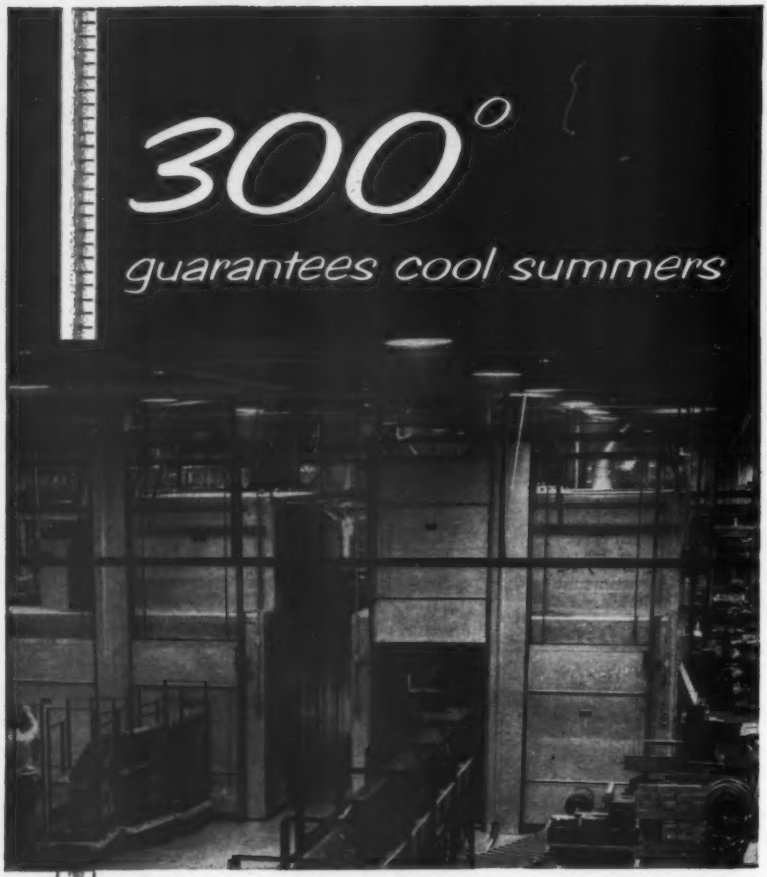
**TYPE LD**

| DESCRIPTION | HEAVY DUTY New | NORMAL DUTY formerly Types H, S, or A | LIGHT DUTY formerly Types D or G |
|---|---|---|---|
| Rating-Ampere Voltage | 30—600 250 or 600V AC, DC | 30—1200 250 or 600V AC, DC | 30—200 250V AC |
| Enclosure | NEMA 12 • Industrial Use (Gasketed) NEMA 4 & 5 • Water-tight & Dust-tight NEMA 7 • Explosion-resisting Class I—Group D NEMA 9 • Explosion-resisting | NEMA 1 • General Purpose NEMA 3R • Raintight | NEMA 1 • General Purpose NEMA 3R • Raintight |
| Horsepower Rating | NEC Fuse Ratings Dual-Element Fuse Ratings | NEC Fuse Rating Dual-Element Fuse Ratings | NEC Fuse Rating |
| Operating Mechanism | Quick-Make, Quick-Break Independent of Handle | Quick-Make, Quick-Break Independent of Handle | Positive Make, Positive Break Spring Assisted |
| Cover | Interlocked & Padlock Attachment | Interlocked & Padlock Attachment | Padlock Attachment |
| Plating—Current Parts | Extra-Heavy Silver | Silver | |
| Endurance | Maximum Endurance Far Exceeds UL Standards | Exceeds UL Standards | Meets UL Standards |

**NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!**

**SQUARE D COMPANY**

**For more facts circle 541 on Reply Card**




*Four huge 27′ long KIRK & BLUM ovens assure efficient dehydration of air conditioning units at WESTINGHOUSE ELECTRIC CO., Staunton, Virginia.*

The ovens are steam heated to 300° F., re-circulating, automatically controlled. Galvanized steel construction resists moisture action. Thick fiberglass insulation minimizes heat loss. There is no external ductwork, except exhaust stacks through roof.

Large console cooling units can be accommodated, since the automatically operated vertical oven doors are 5′ x 8′.

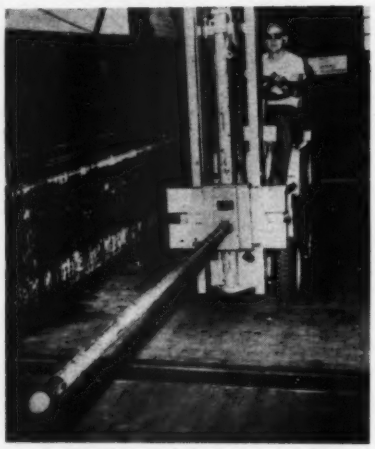
For every oven need, consult KIRK & BLUM. Write for new "Ovens for Industry" catalog. The Kirk & Blum Mfg. Co., 3189 Forrer St., Cincinnati 9, Ohio.

KIRK & BLUM
OVENS FOR INDUSTRY

**For more facts circle 542 on Reply Card**


# OPERATION—PRODUCTION

(O and P begins on page 56)



**Long steel ram mounted on fork plate of truck simplifies carpet roll handling**

lift truck, the steel ram can lift rolls of carpet from floor level to the highest tier of racks for storage. The ram is inserted full length into the carpet rolls for carrying.

When carrying rolls of carpet that are wrapped, (preventing entry of the ram into the core) hooks are suspended from metal rings slipped over the ram and attached to metal strapping binding the roll.

## Quick Change

**Piece of plywood placed on forks of 4000 lb capacity Hyster lift truck, in front of loaded pallet makes snowplow**

## Tool Box Strapped for Moving

**Contributed by Eugene Knowles, Allis-Chalmers Manufacturing Co., Milwaukee, Wis.**

STEEL STRAPS secured to the sides of heavy tool boxes used on the erec-

**use steam efficiently, economically—choose the trap with . . .**

# top quality...

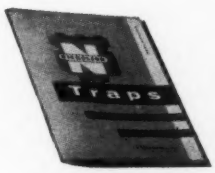
## to keep it on the job

No need for a steam trap to be complicated. All it does is discharge condensate and air from steam lines and equipment. But its importance shouldn't be overlooked. On its effectiveness can rest your economical use of steam . . . the efficiency of your process operations.

A steam trap has to be built to serve long and dependably in severe service—and that's where Nicholson quality counts heavily in terms of performance.

- **One moving part**
- **Positive shutoff—no steam waste**
- **Powerful, intermittent valve action**
- **High capacity—effective use of large orifice**

Specify Nicholson, and be sure.

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NICHOLSON

W. H. NICHOLSON and Company

TRAPS • VALVES • FLOATS • METAL PARTITIONS
LAUNDRY, DRY CLEANING AND PRESSING MACHINERY

14 OREGON STREET, WILKES-BARRE, PA. • SALES AND ENGINEERING OFFICES IN 98 PRINCIPAL CITIES

**For more facts circle 543 on Reply Card**

How NEPTUNE *liquid* METERS

help keep Glidden paint smooth-flowing

Paint covers best . . . and makes repeat sales . . . when it *always* has a smooth, creamy consistency—not drooling all over . . . nor too stiff to spread out. That's where Neptune meters help Glidden. Each batch gets precisely the amount of liquids specified by the formula for best paint performance.

Neptune meters boost Glidden production, too, over slow manual batching. Operator simply presses the buttons to set the amount required . . . opens the valve . . . and meter shuts off at the right amount. Improved plant housekeeping and operator morale are other benefits of measuring liquids the modern way . . . *in the pipe.*

Neptune meters handle over 150 liquids—hot and cold water, syrups, liquid sugars, oils, brines, soap solutions, and many chemicals. Sizes range from ⅝ to 6 in. . . . Capacities from 2 to 1000 gpm.

Ask for Meter Data Book 566-DPE

neptune liquid METERS

NEPTUNE METER COMPANY

19 West 50th Street, New York 20, N. Y.

Branches in: ATLANTA • BOSTON • CHICAGO • DALLAS • DENVER • LOS ANGELES LOUISVILLE • No. KANSAS CITY, Mo. • PHILADELPHIA • PORTLAND, ORE. SAN FRANCISCO, (Millbrae) • IN CANADA: TORONTO 14, ONT.

For more facts circle 544 on Reply Card

# OPERATION — PRODUCTION

(O and P begins on page 56)

**Sturdy steel straps make for the safe lifting of heavy tool boxes by crane**

tion floor, make it possible to move the boxes safely from one area to another by crane.

The straps, 2 in. wide and ¼ in. thick, are located slightly forward of the center of gravity. This tilts the boxes backward when they are lifted, preventing the drawers from falling open. A hole at each end of the strap provides easy hitching on the crane.

## Hot Upset Welding Cuts Costs

PRODUCTION of steel frame window frames and sash at the U. S. Gypsum Co., Warren, Ohio, was boosted by 40 per cent and labor costs were cut in

**Hot upset welding is used to join sash assembly. Parts are positioned by hand**

half by using resistance welders to join frame and sash sections.

The welders, of the hot upsetting type, replaced air hammers which pre-

*"Doc! It's like fighting DERMATITIS with an armored glove."*

Except WEST *protective gloves* are invisible:

— quickly applied
— comfortable to wear
— easily washed away.

For skin exposed to oils, dust, grease and grime:
— use PROTECTIVE CREAM #211.

For skin exposed to acids, alkalies and inorganic chemicals:
— use PROTECTIVE CREAM #311.

For skin exposed to organic solvents, acetates and cutting oils:
— use PROTECTIVE CREAM #411.

WEST PROTECTIVE CREAMS protect against hundreds of troublesome industrial irritants. They're antiseptic. Inhibit harmful bacteria with Hexachlorophene. And they protect *for extended periods of time.*

# How Convair stops Dermatitis before it starts

**A simple safety precaution is preventing dermatitis at the huge $71,000,000 aircraft plant of Convair at Fort Worth, Texas. SAFETY ENGINEER S. A. GROSS (above) tells employees how to protect their hands against outbreaks of dermatitis with West Protective Cream #311. They cooperate — with their own well-being in mind. The result has been a reduction in the incidence of dermatitis to almost nil.**

**Would similar results interest you? Send the coupon.**

LARGEST COMPANY OF ITS KIND IN THE WORLD

WEST DISINFECTING Company

WEST DISINFECTING COMPANY, 42-16 West Street, Long Island City 1, N. Y.
Branches in principal cities • In Canada: 5621-23 Casgrain Ave., Montreal

☐ Please send your 24 page booklet "The Control of Dermatitis in Industry."
☐ Please have a West representative telephone for an appointment.

Name.....

Position.....

Mail this coupon with your letterhead to Dept. 19

**For more facts circle 545 on Reply Card**

# *Snap-on* Impact Sockets last 5 times longer . . . and then some

## ...on Railroad Car Assembly Line

C. S. BRACKEN
*Snap-on* Sales Engineer

American Car and Foundry, Division of ACF Industries, Incorporated, uses impact sockets in its Huntington, West Virginia, plant on a temporary bolting operation during fabrication of railroad car spines.

Power impact sockets used on this job formerly lasted about 12 shifts. Then *Snap-on* sales engineer, C. S. Bracken, suggested a specially heat-treated *Snap-on* Socket. Result: now, after 65 shifts, the *Snap-on* Sockets have shown no visible sign of wear. Conservative estimates are that this switch to *Snap-on* Sockets will result in a saving of several hundred dollars per year.

## *Snap-on* tool specialist as near as your phone

The *Snap-on* sales engineer is a specialist who devotes *all* of his time to the industrial application of hand tools. He welcomes the opportunity to answer questions and help you get the most out of the tools you use in your business. Write us for his name or call your nearest *Snap-on* branch. Free catalog of industrial wrenches and hand tools is yours for the asking.

*Snap-on is the trademark of Snap-on Tools Corporation

**SNAP-ON TOOLS CORPORATION**
8068-A 28th Avenue • Kenosha, Wisconsin

For more facts circle 546 on Reply Card


# OPERATION — PRODUCTION

(O and P begins on page 56)

viously cold headed the sections, clinching the frame parts together. The new production technique reduced the number of workers required from four to two, since each welding machine requires only one operator. In addition, an inspector who checked the cold-headed joints was assigned other work.

To weld the parts, operators place the frame and sash parts in position and activate the hot upsetters. The completed assemblies are removed and placed on an overhead conveyor which takes them to finishing stations. One welder joins frames; the other, sash. Each pair then goes through finishing operations as a unit. Tooling on the Taylor-Winfield welders permits adjustment for hot upsetting all sizes of frames and sash.

Uniformly high quality of the hot upset joints makes inspection unnecessary, according to A. W. Simon, production superintendent of the plant. He also reported improved morale and less worker fatigue as a result of eliminating the noise and vibration of the air hammers.

## Crane Ducks Its Head

FACED WITH the problem of installing crane bridges and heavy machinery in a new plant with low head-

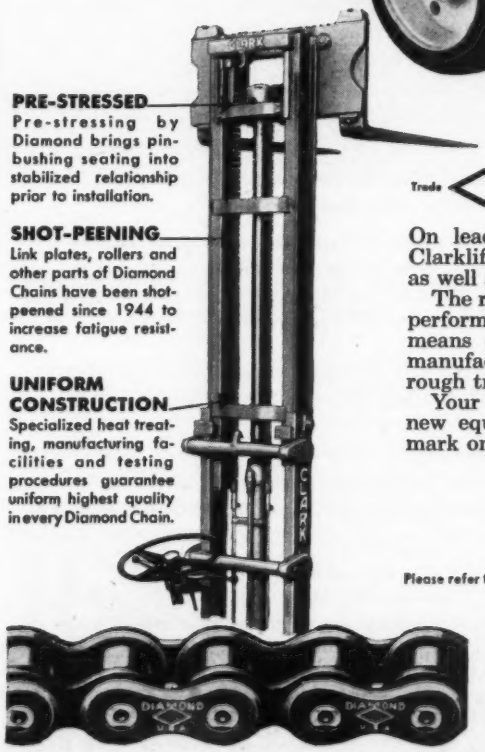
**Mobile crane, fitted with special hoe boom, maneuvers in low head room area**

room clearances, a contractor fitted a Lorain Moto-Crane with a 19-ft hoe boom, reworked to use crane sheaves and hook block.

The unit set five 30-ft crane bridges and installed machines weighing up to 10 tons in areas with overhead clearances ranging from 14 to 24 ft.

Using this specially-designed crane, both the time and cost to move the machinery were far less than the original estimate, which was based on the use of riggers for the installing work.

# Pre-stressed Diamond Roller Chains pass highest lifting standards for Clark Equipment




**PRE-STRESSED**
Pre-stressing by Diamond brings pin-bushing seating into stabilized relationship prior to installation.

**SHOT-PEENING**
Link plates, rollers and other parts of Diamond Chains have been shot-peened since 1944 to increase fatigue resistance.

**UNIFORM CONSTRUCTION**
Specialized heat treating, manufacturing facilities and testing procedures guarantee uniform highest quality in every Diamond Chain.

Trade ◇ Mark

On leading makes of materials handling equipment, such as the Clarklift 40 illustrated, Diamond Roller Chain is first choice for lifting as well as for other power transmission requirements.

The reasons are clear. Diamond Roller Chains give more economical performance over a longer service life. Their extra high uniform quality means dependable, safe operation. Pre-stressing and other special manufacturing techniques increase Diamond Chains' ability to take rough treatment and minimize maintenance at the same time.

Your records will show that it pays to specify Diamond Chain for new equipment and for replacement. Look for the Diamond trade mark on the links.

**DIAMOND CHAIN COMPANY, Inc.**

*Where High Quality is Traditional*

**Dept. 614, 402 Kentucky Ave., Indianapolis 7, Indiana**

**Offices and Distributors in All Principal Cities**

Please refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER




DIAMOND ROLLER CHAINS

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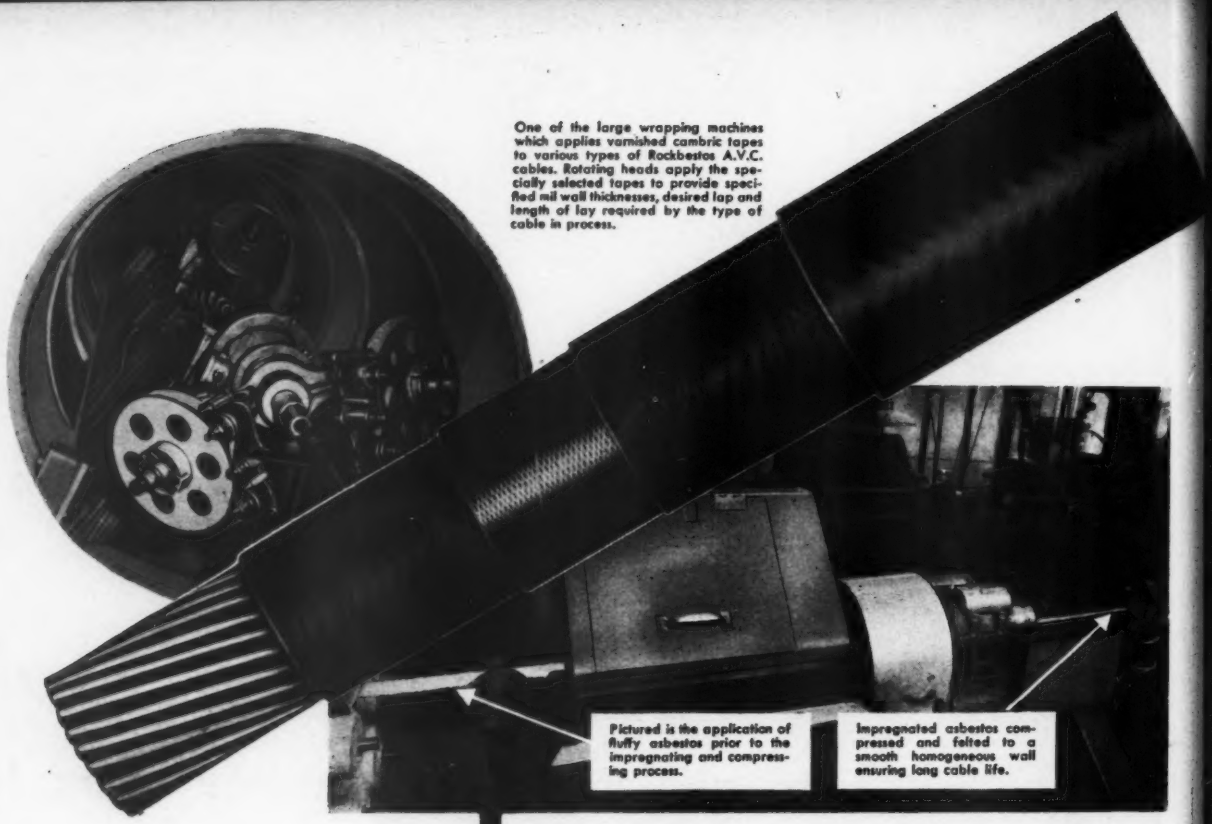
One of the large wrapping machines which applies varnished cambric tapes to various types of Rockbestos A.V.C. cables. Rotating heads apply the specially selected tapes to provide specified mil wall thicknesses, desired lap and length of lay required by the type of cable in process.
Pictured is the application of fluffy asbestos prior to the impregnating and compressing process.
Impregnated asbestos compressed and felted to a smooth homogeneous wall ensuring long cable life.

# Quality Varnished Cambric Tapes

**+**

**felted asbestos walls impregnated with selected compounds add up to long life Rockbestos A.V.C. (N.E.C. Type AVA)**

Made to Rockbestos' exacting specifications which incorporate standards beyond those called for by industry, Rockbestos varnished cambric tapes assure you of these plus values:

- ★ **A special surface treatment which insures that the tape will wrap properly, providing uniform dielectric strength and good bending characteristics in the completed cable.**
- ★ **Special surface hardness tests which mean varnish film that will not become damaged in processing or handling.**
- ★ **Rigid tape thickness requirements which give you uniformity of cable diameters.**
- ★ **Add to this thirty years of know-how in the application of VC tapes for high temperature application on Rockbestos A.V.C. cables and you have A.V.C. cable that insures trouble-free operation and long life.**

In the Rockbestos A.V.C. construction dense, felted asbestos walls, impregnated with selected compounds, seal the quality VC tapes away from air and moisture . . . give added strength against damage and flexing.

The result . . . you get long life and dependable service under every type of operating condition . . . in temperatures up to 230°F.

Complete construction and test specifications of Rockbestos A.V.C. are in the new booklet "Specifications RSS-88." Write today for your Free copy.

## ROCKBESTOS PRODUCTS CORP.
## NEW HAVEN 4, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT • CHICAGO • PITTSBURGH • ST. LOUIS
LOS ANGELES • NEW ORLEANS • OAKLAND, CALIFORNIA • SEATTLE

**STOCKED COAST TO COAST**
Standard Rockbestos A.V.C. construction (N.E.C. types AVA, AVB, etc.) are available for immediate shipment. Call or write nearest branch office.

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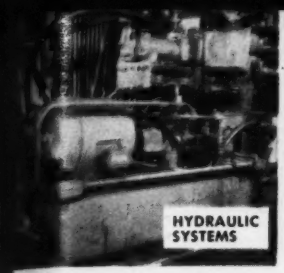
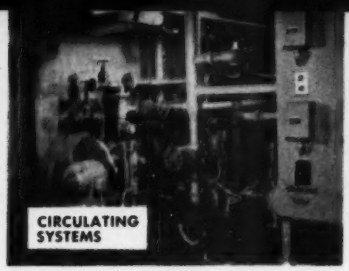
**For more facts circle 549 on Reply Card**

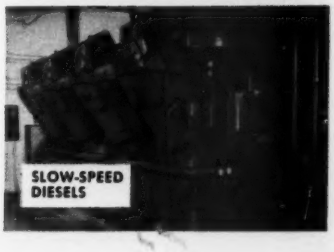


# SUN SOLNUS OILS IDEAL LUBRICANTS FOR 80% OF ALL APPLICATIONS

**Moderately priced...low in carbon-forming tendencies,** Sun Solnus® oils simplify your storage problems by doing with *one oil* many jobs that would otherwise require *several.* Their ability to protect metal parts against corrosion, their resistance to oxidation, and their moderate price all add up to "more lubrication per dollar."

For technical information, see your Sun representative, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-51.




SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

**SUN OIL COMPANY**

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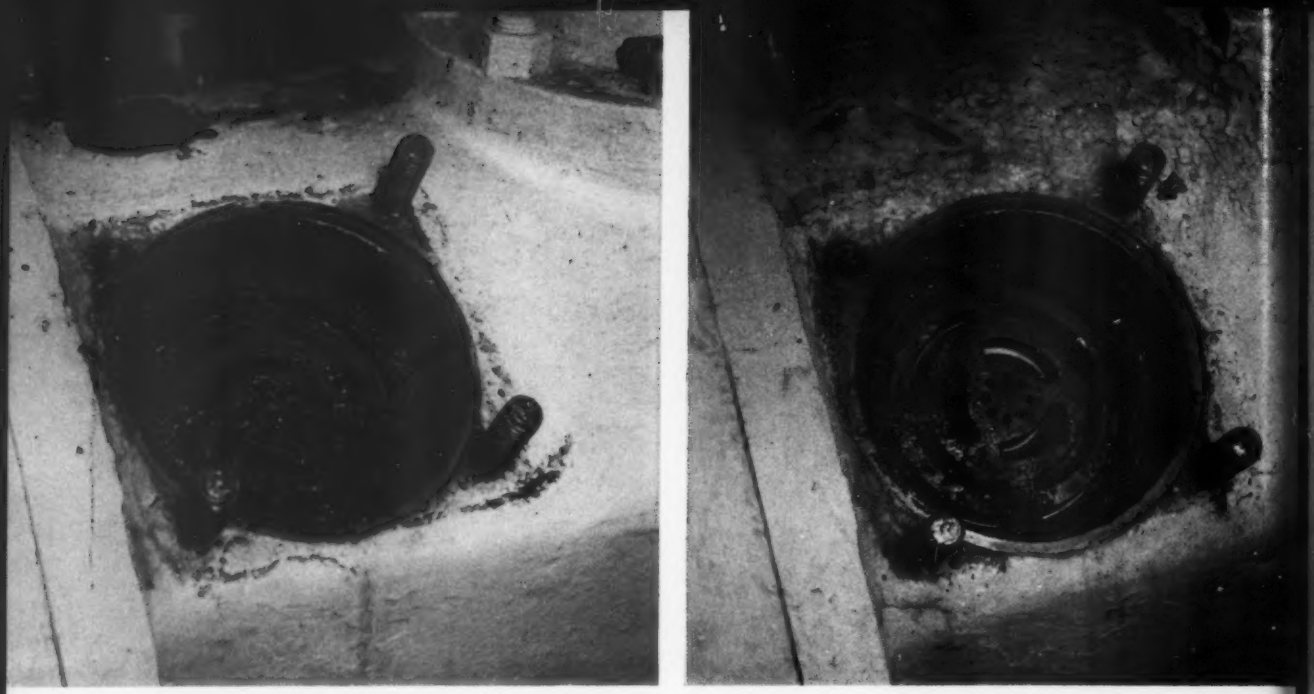
In Canada: SUN OIL COMPANY LIMITED, Toronto and Montreal



Valve on left is from compressor run for 3,000 hours with well-known, high-grade oil. At right is same valve after a 3,000-hour run with Sun Solnus oil. Note difference in carbon deposits.

# 3000-HOUR TEST PROVES SUN SOLNUS OILS REDUCE CARBON BUILD-UP IN COMPRESSORS

**Equipment:** A three-stage Norwalk horizontal-type compressor. Operating pressure: from 1,000 to 1,500 psi.

**Test:** The compressor was cleaned thoroughly and filled with a well-known, high-grade oil. The equipment was run for 3,000 hours, then torn down for inspection and cleaning. Then Solnus® 300 was tested in the same way.

**Results:** Look at the two pictures. You can see for yourself how Solnus oil reduced dangerous carbon build-up.

All types of reciprocating air compressors that have been changed over to a Sun Solnus oil show similar results. A test in your compressor will show the same remarkable reduction of carbon deposits.

You can get a technical bulletin about Sun Solnus oils by asking your Sun representative, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-52.

SUNOCO

**INDUSTRIAL PRODUCTS DEPARTMENT**

**SUN OIL COMPANY** PHILADELPHIA 3, PA.

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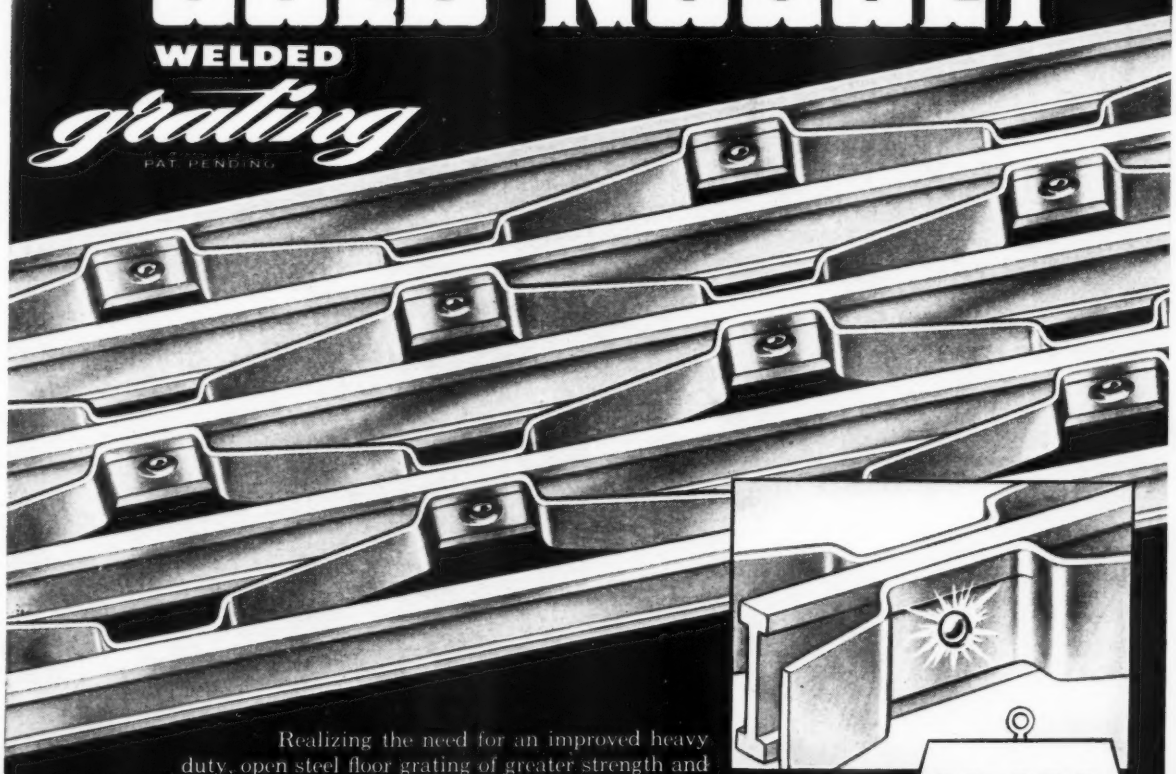
IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

*Announcing*

# GOLD NUGGET®

## WELDED *grating*

PAT. PENDING





**10,000 POUNDS**

Realizing the need for an improved heavy duty, open steel floor grating of greater strength and economy, The GLOBE Company presents GOLD NUGGET Welded Grating — the first grating to take advantage of modern engineering design. As a result of this improved design, the GOLD NUGGET primary load bar provides 22% more strength with 14% less weight. The primary load bar is a miniature I-beam with all of the advantages of a true structural member.

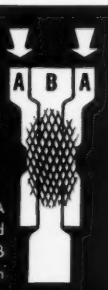
GOLD NUGGET Welded Grating is recommended for power houses, loading docks, oil refineries, fire escapes, drain grates, plating rooms, filtration rooms and for all types of heavy duty platforms.

### GOLD NUGGET

- 3/8" projection weld nugget for greater rigidity and strength
- vertical alignment of the main load bars assured
- all bars are load carrying bars including secondary bars
- anti-skid pattern

For the complete details of this revolutionary new grating, write for new catalog today.

Distributors in all principal cities. Consult the yellow pages in your phone book under "GRATING."




### PROJECTION WELD

Each secondary load bar (A above), as projected welded to the primary load bar (B above) has a shear strength of 5,000 pounds per weld. There are 28 such projection welds to a square foot of grating. This means that GOLD NUGGET Welded Grating can sustain greater shock loads than other gratings.

*The* **GLOBE** *Company* MANUFACTURERS SINCE 1914

**PRODUCTS DIVISION**

SAFETY GRIP-STRUT GRATING · GOLD NUGGET WELDED GRATING · CABLE-STRUT AND GLOBETRAY CABLE RACEWAYS

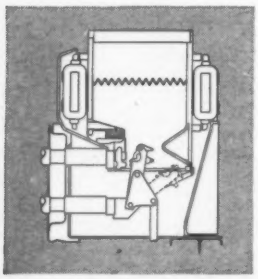
4016 S. PRINCETON AVE., CHICAGO 9, ILL.

# METAL-CLAD SWITCHGEAR

# BETTER PROTECTION AGAINST HIGH CURRENT FAULTS

## uniform flux density across whole arc chute

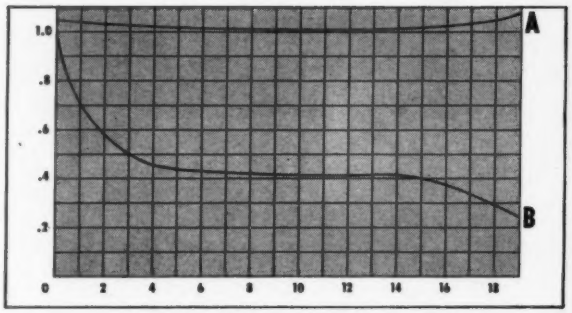
When a high current fault opens an I-T-E 15 kv circuit breaker, the arc is practically swallowed up in the arc chute—faster and over a longer path than has ever before been possible. The reason lies in two unique construction features found only in I-T-E circuit breakers:



Path of arc through chute equipped with twin coils.

**1. Twin coils and closed loop magnet.** Arc current through the twin blowout coils develops a stronger flux density that is uniform across the entire arc chute. Arc is stretched farther, faster—cooled and extinguished in less time. And the forward part of the arc chute comes into use just as much as the back part. So arc chute life is significantly prolonged.

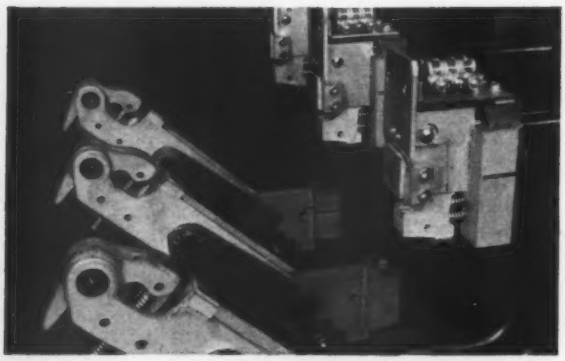
**2. Laminated iron of transformer quality.** This superior iron construction keeps losses to a minimum. Magnetic field is not only stronger, but rises and falls in phase with the current through the arc. Thus the greatest magnetic pull on the arc occurs when it is most needed—at the top of the current cycles. These are both extra-quality construction features of the sort you can expect to find in I-T-E switchgear. All together,



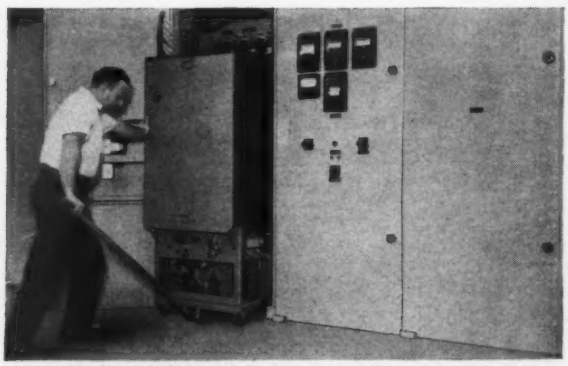

Flux density across entire length of arc chute.
A. Twin coil B. Single coil

I-T-E quality means generally superior performance, better endurance under handling, and longer life in service. Yet it costs you no more.

Get complete information on I-T-E metal-clad switchgear—and the many engineering services available to help you realize greater economy and satisfaction in a system that meets your requirements. Available in ratings from 2.3 through 13.8 kv, 50 through 750 mva interrupting, and up to 3000 amperes continuous. Write to I-T-E Circuit Breaker Company, Switchgear Division, 19th & Hamilton Sts., Phila. 30, Pa.



Fast interruption of low current arcs. As breaker opens, pistons force a jet of air between contact points—driving arc up into arc chute.



Horizontal drawout. Easiest to handle, safest, most convenient assembly known. So strong that switchgear is shipped factory assembled and ready for installation.

## I-T-E CIRCUIT BREAKER COMPANY—Switchgear Division

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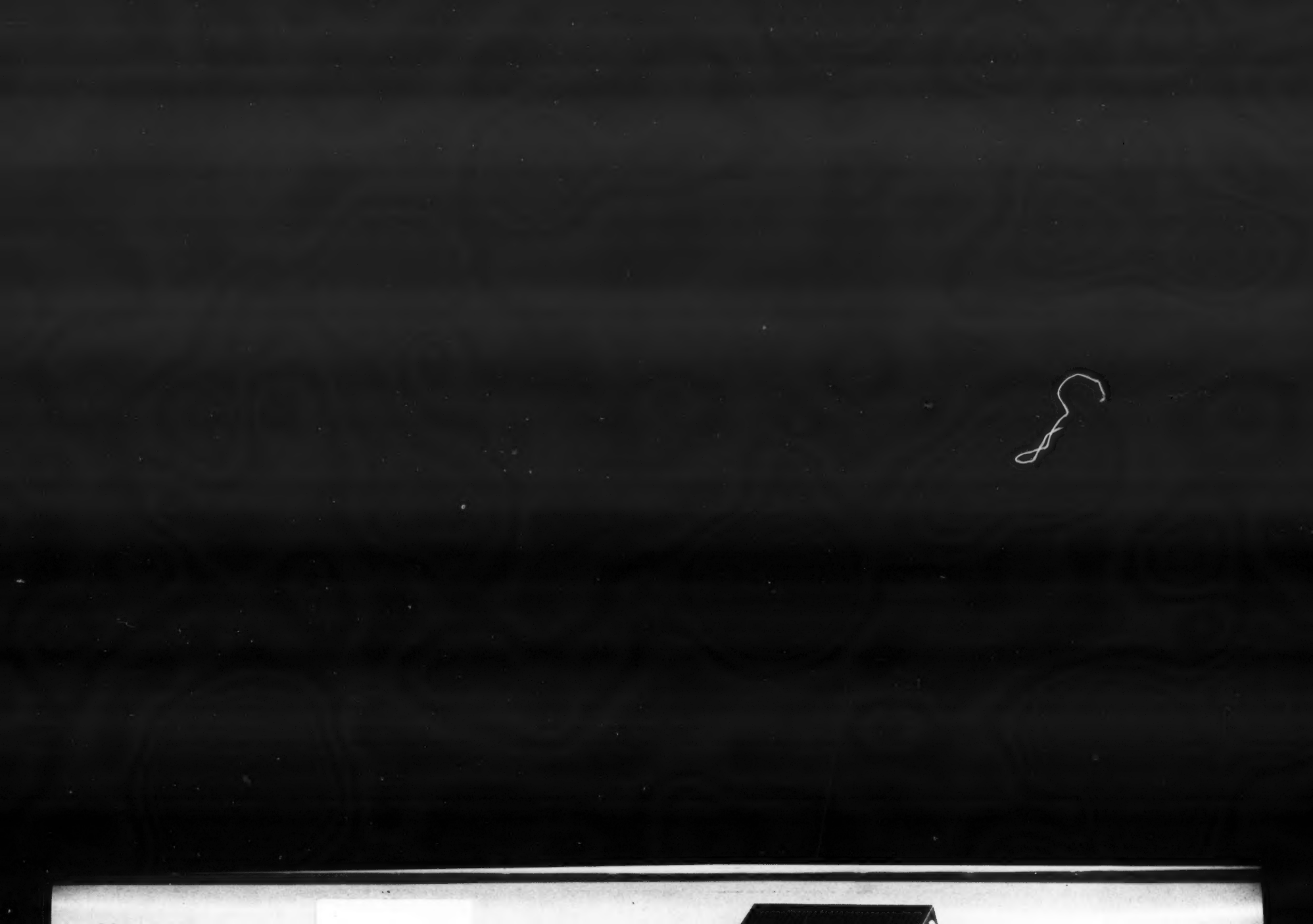
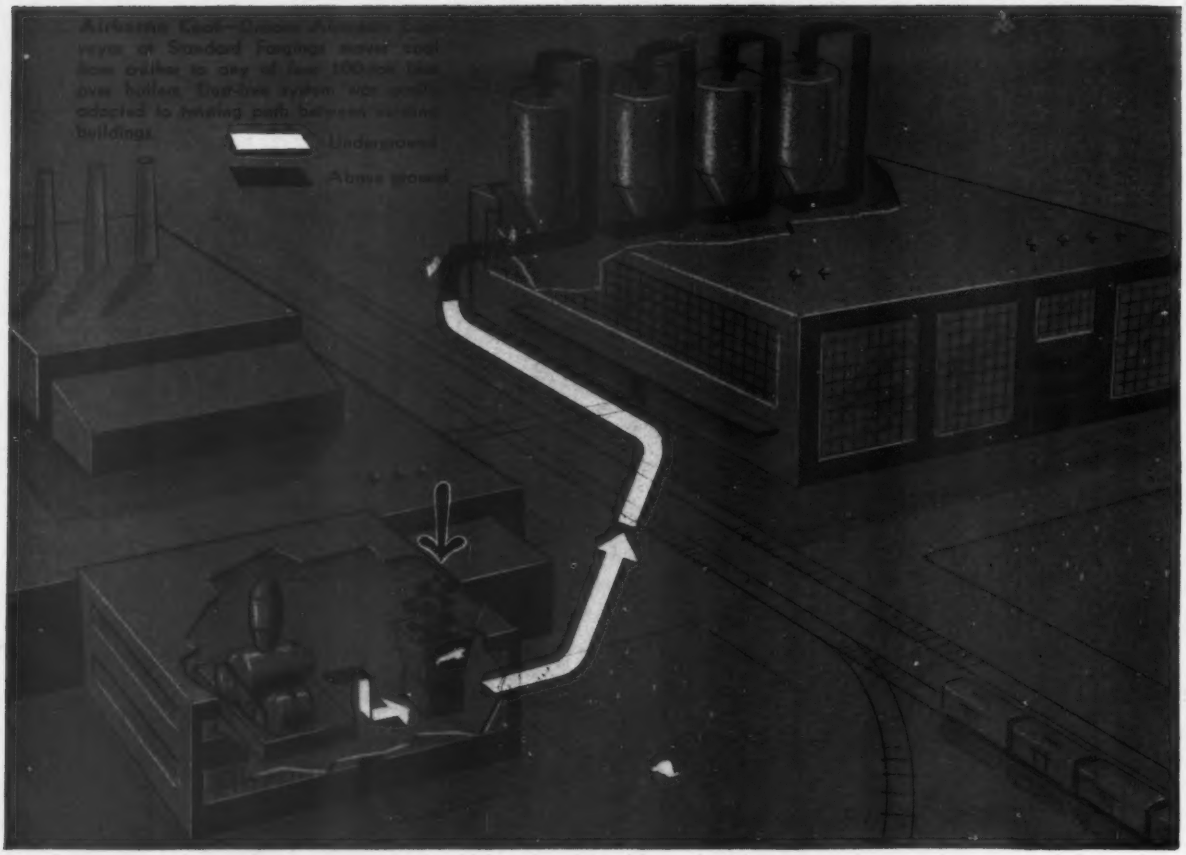


TWIN COILS
CLOSED MAGNET LOOP
Laminated Iron
of Transformer Quality
I-T-E



# conveying coal by *Airstream* cuts first cost 60%, saves $35,000 per year

**Control Station**—One man operates complete Dracco coal handling system from graphic control panel. Lights show flow path, switches permit remote control.

In a recent modernization program, Standard Forgings Corp., East Chicago (Ind.) installed a Dracco Airstream Conveyor to handle coal from crushers to boilers. This move has paid off in a big way—first cost was 60% less than an all-mechanical conveyor . . . savings in coal and other costs have piled up at the rate of over $35,000 per year!

Compared with the old system, here are the Dracco-introduced improvements–one operator controls system . . . daily coal requirements moved in one shift instead of three . . . use of lower grade coal costing one dollar less per ton . . . annoying, costly and potentially dangerous coal dust problem licked.

With an automatic Dracco Airstream Conveyor, coal is transported at 30 tons per hour through a dust-tight system. One operator, aided by bin-level indicators and remote-controlled diverter gates, controls all handling from a central switch panel. There is no waste, loss or spillage of coal. System maintenance is practically zero.

If you handle coal or any other dry bulk material, you can move it anywhere . . . with less labor . . . lower material cost . . . and no dust, danger or contamination with an Airstream Conveyor. Call in a Dracco engineer today.

**DRACCO CORPORATION**

**4035 East 116th Street • Cleveland 5, Ohio**

*Dracco Bulletin 529, "Airstream Conveyors", contains detailed information on equipment and uses. Shows examples. For your copy, write Dracco today.*

**DRACCO** *Performance Proved*

*Airstream* CONVEYORS · DUST CONTROL EQUIPMENT

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## Protect Plant and Equipment with

# TYGON "ATD" *Hot Spray* PAINT

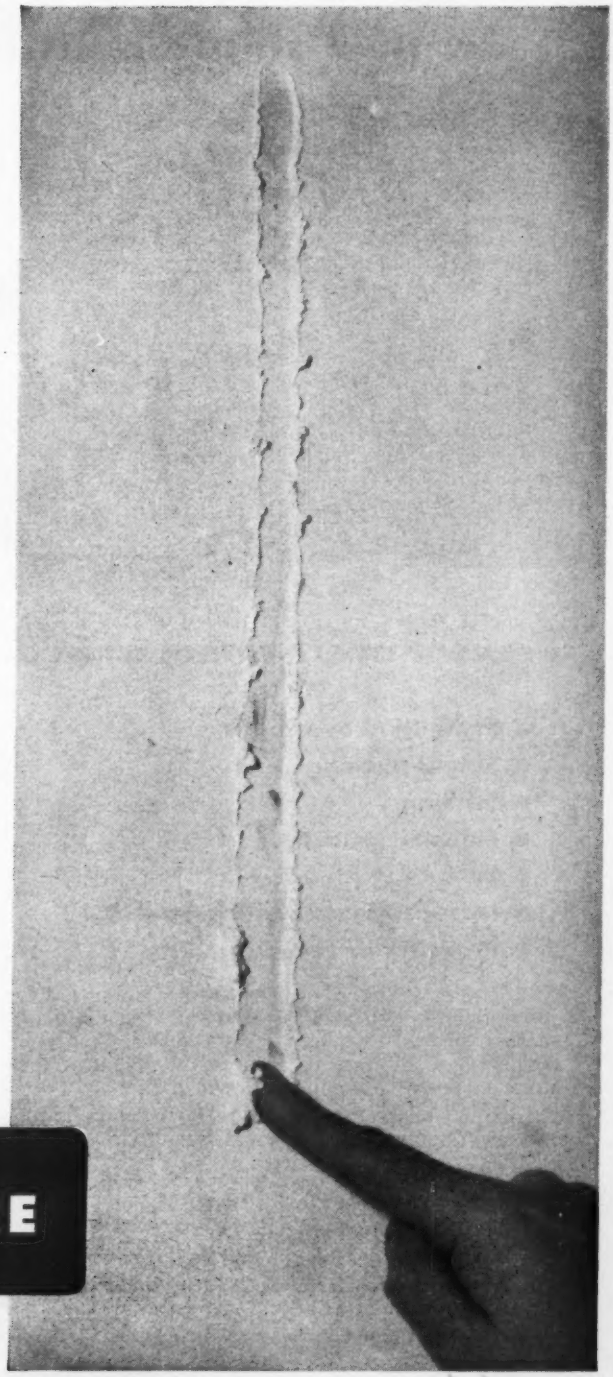
## *and save three ways:*

1. **Lower Applied Cost**
2. **Less Down Time**
3. **Longer Lasting Protection**

It takes thickness in a paint film to give effective, long lasting protection against chemical attack. Corrosion engineers call it the "magic five mils." But to obtain a 5 mil film with conventional cold spray paints means four to five coats, with eight to ten hours drying time between.

But Tygon "ATD" Hot Spray builds the magic five mils in just two slow passes of the spray gun. Labor costs are cut 20%-30%. Down time is held to a minimum. And you get all of the protection against corrosive attack for which Tygon plastic is famous.

**Write for the**
**TYGON COATING MANUAL**
**This "just-off-the-press" manual is filled with data to make your battle against corrosion easier.**



PLASTICS AND SYNTHETICS DIVISION

**U. S. STONEWARE**

AKRON 9, OHIO

**New York** **Chicago** **Houston**

154E

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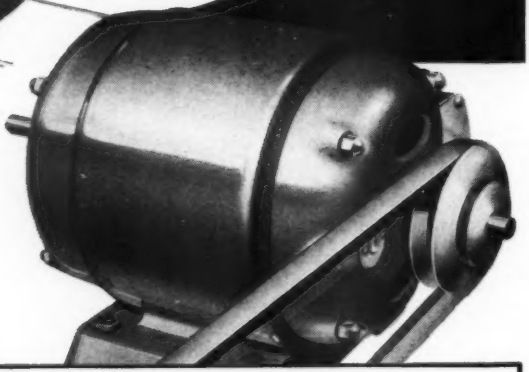
## Get Full Protection Engineered into

# 3-Phase Motors

## with a single built-in Klixon Protector



### *Prevent overheating caused* BY

- **Prolonged overloads**
- **Single phasing**
- **Stalling**
- **Failure to start**
- **Lack of ventilation**
- **Increase in ambient temperature**
- **Plugging or reversing duty**

Motor manufacturers everywhere are doing a fine job of building Klixon Protectors into their 3-phase motors, just as they have over the years in their single phase motors, to assure you of maximum work output with minimum down time.

Klixon 3-phase Protectors are now available for motors ranging from fractional HP up to 7½ HP (600V).

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# COURT DECISIONS — a summary of legal findings of interest to the plant engineer

*Prepared by Albert Woodruff Gray*

## Patent Essentials

SUIT WAS brought for what the patentee contended was an infringement of a device for bailing metal scrap on which he owned the patent. Instead of one cover, as used in the original device, this new device uses a split cover, permitting the refilling of the bailer before the entire compressing process was completed.

In its decision that this improvement was sufficient to escape the charge of infringement, the court said, "All patents disclose invention but all inventions are not patentable. The statute defines what inventions are patentable and novelty is only one of the ultimate facts required. If one constructs something new he has invented it but that does not mean that it is patentable. Frequently an invention is the result of mere mechanical skill or it may be anticipated by the prior art, although not precisely the same, or it may not be useful. In each of such events the device or product is not a patentable invention but it is an invention nevertheless.

"Generally speaking with reference to the subject matter permitted to be patented there are four ultimate facts which must exist before the invention is patentable—authorship, ownership, novelty, not as a result of mere mechanical skill, and utility. If they exist concurrently the disclosure is patentable. If one is lacking it is not patentable." Galland-Henning Mfg. Co. v. Longemann, 142 Fed. 2d 700.

## Adequate Warning

CONTRACT WITH THE United States provided for replacing acid drain lines leading to storage tanks at Mare Island Shipyards. When an employee of this contractor loosened the bolts of a flange holding two pipes together this freed a flow of acid and the man was seriously burned.

It was assumed by the workman that there was no acid present since he had seen none and since the tanks had not been painted a distinctive color denoting acid nor was there acid present in an adjacent tank.

Notice however had been given this workman that he was working in an area where he might encounter acid, especially in the old pipes and that showers were located under the tanks in the event of any contact with acid.

In its refusal to allow a recovery for injuries suffered by this workman, the Federal Court said,

"The workman was given ample warning of the existence or a possible presence of acid in the storage tanks and in old pipes which he might encounter. There was a sign on a service line indicating that it contained acid. Near the scene of the accident there was a trailer which was marked with a similar sign, reading—'Danger: Acid.' Further the schematic drawing disclosed that the tanks were used to store 5000 gal of acid.

"With this prior information it required no special training, knowledge or power of observation on his part to determine the actual presence of acid. The United States, after having warned the workman of the danger was therefore relieved of responsibility of continually warning him of the danger." Mayfield v. United States, 136 F.S. 780, California.

## Professional Engineers

TWO EMPLOYEES OF A Maryland corporation, engaged in the production of explosives and munitions, recently sued to recover overtime compensation which the employer had refused to pay on the ground that their services were within the provisions of the Fair Labor Standards Act, exempting professional employees from its wage and hour provisions.

These men were employed as machine designers. Both had received a technical education in draftmanship and machine designing but neither had an academic degree.

The court in characterization of the work of a machine designer said, in part, "Machine designers require special technical study and education for their field of work. They must be familiar with the scientific literature and understand the nature of physical actions and phenomena known as torque, inertia, stresses and linkages. The type of work is predominantly intellectual and creative rather than routine. The work of a machine designer requires the exercise of discretion or judgment in its performance and being creative and predominantly intellectual in nature cannot be standardized in relation to a given period of time."

Then in its decision that these employees were within the exemption of the Fair Labor Standards Act and as professional employees not entitled to an award of the overtime wages they sought to recover, the court said in conclusion,

"The present definition has been productive of some confusion. It is clear that many employees in the traditionally learned professions would be exempt but it is not clear to what extent the definition is supposed to apply to employees in the more modern professions.

"A machine design has no utility until the ideas are concretely translated onto paper by layout or detailed work. The latter is therefore clearly essential to and a necessary incident of the design. For these reasons I think the work of these employees was within the definition of professional." Aulen v. Triumph Explosive Co., 58 F.S. 4.

## Pollution of Stream

ON THE SOUTH bank of Three Mile Creek in the western section of Mobile, Alabama, is a paper manufacturing plant. On the north side of the creek is an exclusive residential area, "Chateaugay Place."

The residential owners recently applied to the Alabama court for an injunction against the pollution of the creek by the plant and for damages for the injuries already suffered.

They maintained that clean and wholesome water normally flowed in this stream, but now was pumped out by the plant and returned to the creek saturated with dye and paper pulp and reeking with foul odors that filled their homes.

In their petition, these residents asked not only that this discharge of waste and filth be stopped and the creek cleared of refuse but also that the plant owners pay in damages what these residents had suffered from this nuisance.

Nuisance is defined in the Alabama statutes as, "Anything that worketh hurt, inconvenience or damage to another; and the fact that the act done may otherwise be lawful does not keep it from being a nuisance. The inconvenience complained of must not be fanciful or such as would affect only one of fastidious taste, but it should be such as would affect the ordinary, reasonable man."

In its decision against the paper plant that its activities were a nuisance under this statute, the court said, "We are fully persuaded that these property owners suffer an inconvenience, annoyance and injury from the conduct

# COURT DECISIONS

of this paper plant not endured by the general public and, of consequence, they suffer a substantial damage peculiar to them, not suffered in common by the general public. Being so circumstanced, these property owners may in their own names and right maintain the action to abate the nuisance, notwithstanding the city could maintain a similar action." Stone Container Corp. v. Stapler, 83 So. 2d 283, Alabama, November 10, 1955.

## Machine Replacements

IN A LAWSUIT, the purchaser of a patented planing machine was charged with infringing the patent when he replaced the worn out knives with new ones.

In its outline of the extent to which the purchaser of patented machine may make repairs and remain free of this charge of infringement, the Supreme Court of the United States said,

"If the right to make does not exist there is no right to rebuild the combination, but it does not follow when one of the elements of the combination has become so much worn as to be inoperative or has been broken that the machine no longer exists for restoration to its original use by the owner who has bought its use. When wear or injury is partial then repair is restoration, not reconstruction.

"The right to repair and replace in such a case is either in the patentee or in him who has bought the machine. Has the patentee a more equitable right to force the disuse of the machine entirely on account of the inoperativeness of a part of it than the purchaser has to repair, who has in the whole of it a right of use? And what harm is done to the patentee in the use of his right of invention when the repair and replacement of a partial injury are confined to the machine which the purchaser has bought?" Wilson v. Simpson, 9 How. (U. S.) 109.

## Engineering License Statute

IN AN ILLINOIS statute for the licensing of engineers it was provided in part, that, "Any person practicing or offering to practice professional engineering is required to submit evidence that he is qualified so to practice." Further, "It is unlawful for any person not so registered to practice or offer to practice professional engineering in this state."

This was followed by the definition of "professional engineering" as, "Professional engineering means any professional service such as consultation, investigation, valuation, planning, design or supervision of construction in connection with any public or private utilities, structures, buildings, machines, equipment, processes, works or projects, wherein the public welfare or the safeguarding of life, health or property is concerned or involved when such professional service requires the application of engineering principles and data."

In casting out this statute as unconstitutional the Supreme Court of that state said,

"If the answers of the applicant to the questions satisfy the committee that he is competent to practice any branch of engineering, for instance that branch of engineering relating to the construction of highways, he is licensed not only in that branch but as a mining engineer, an electrical engineer, a chemical engineer, an hydraulic engineer, an aeronautics engineer, a petroleum engineer, an automotive engineer and all of the hundreds of other kinds of engineers known to the ever expanding and indefinite vocabulary of modern science and industry.

"There is no more flexible word in our language than the word engineer. The term includes everything and defines nothing." Krebs v. Thompson, 56 N.E.2d 761, Illinois.

## Trade Secrets

IN A SUIT BROUGHT by a Minnesota manufacturer against a competitor, it was claimed that trade secrets had been acquired by this competitor through disclosure by a disloyal employee of the manufacturer. In this suit an injunction was asked against the use of this information by the competitor, for an accounting of the profits and for damages.

In the contract of this employee however, there was no provision against disclosures of this character. On this feature the competitor rested its defense, contending that under the circumstances there had been no breach of contract.

"Does protection of an employer's trade secrets against adverse competitive use by an employee or former employee depend upon a valid and enforceable covenant of secrecy? I find that the authorities say that it does not," asserted the court, in holding the use of information acquired in this manner illegal and subject to restraint by injunction. "They say that if a secret is in confidence or in a confidential relationship, it will be protected as against those who through breach of trust or violated confidence, attempt to apply the secret to their own use, or to impart it to others, or otherwise stated, it will nevertheless be protected from disclosure by one to whom it has been revealed in confidence.

"This is a rule of public policy and is founded on a profound knowledge of the human intellect and of the motives that inspire the actions of men. And the law peremptorily forbids everyone who, in a position of trust, has acquired information concerning or interest in the business or property of a competitor, from using that knowledge or interest to prevent the competitor from accomplishing the purpose of the relation." Jerrold-Stephens Co. v. Gustaveson, 138 F. S. 11, Mo.

## Piracy of Designs

WHEN THE PATENT expired on a toggle clamp, a device for clamping parts in industrial production, the clamps were copied by a competitor of the patentee. They were, however, manufactured and sold under the name of this competitor and not under the trade mark of the original patentee.

Suit was brought by the patentee for an injunction against the manufacture and sale of clamps which were "confusingly similar."

In granting this injunction, the lower court asserted that the company might use all of the patented features of this expired patent provided they were used fairly. But, the court said it had seldom seen a more flagrant abuse of the rights of a patentee than by this competitor which now sought the blessing of the court.

The unnecessary copying of unimportant parts of any article or device, the court said, was unfair competition if by doing so the article appeared to have been manufactured by one whose reputation would stimulate sales.

This decision was appealed and the judgment reversed with the comment by the appellate court,

"It is only when the imitation is likely to deceive prospective customers who care about source that the imitator is guilty of unfair competition. From an examination of the clamps made by the second company and of those made by the patentee showing the different trade marks affixed, and, upon inspection of the second company's advertisements of its clamps clearly disclosing that it was the manufacturer of such clamps, it is clear that no purchaser exercising ordinary care could have been confused as to the source or producer of the second company's clamps." West Point Mfg. Co. v. Detroit Stampings Co., 222 Fed. 2d 581, April 26, 1955.

# Rolling Steel Doors

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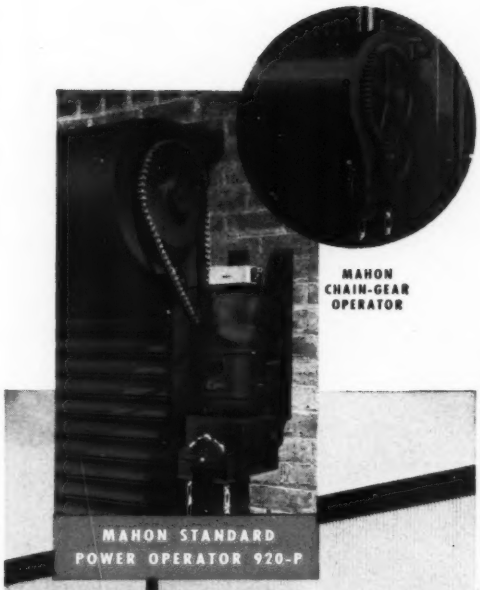


In railroad and truck openings in industrial and commercial buildings, rolling steel doors offer definite timesaving and space-saving advantages . . . the vertical roll-up action of the door requires no usable space either inside or outside the opening—the rolling door curtain is compactly rolled up over the lintel safe from damage when the door is open; and, there are no overhead tracks or other obstructions to interfere with crane handling. No other type of door can give you the everyday operating convenience of a quick-opening, quick-closing power operated rolling steel door—signal arrangements and push-button stations can be located at any point for remote control. And no other type of door can give you the positive security, firesafety and permanence provided by a good rolling steel door . . . all-metal construction reduces maintenance to a negligible factor, and assures a lifetime of trouble-free service. When you buy a rolling steel door, it will pay you to check specifications carefully . . . you'll find Mahon doors are built better to give you better service over a longer period of time—for instance, the galvanized material in Mahon curtain slats is BONDERIZED and DIP-COATED with synthetic enamel which is baked on at 350° F. prior to roll-forming. Comparison will disclose other quality and design features in Mahon Rolling Steel Doors that add up to a greater over-all value. See Sweet's Files for information including Specifications, or write for Catalog G-57.

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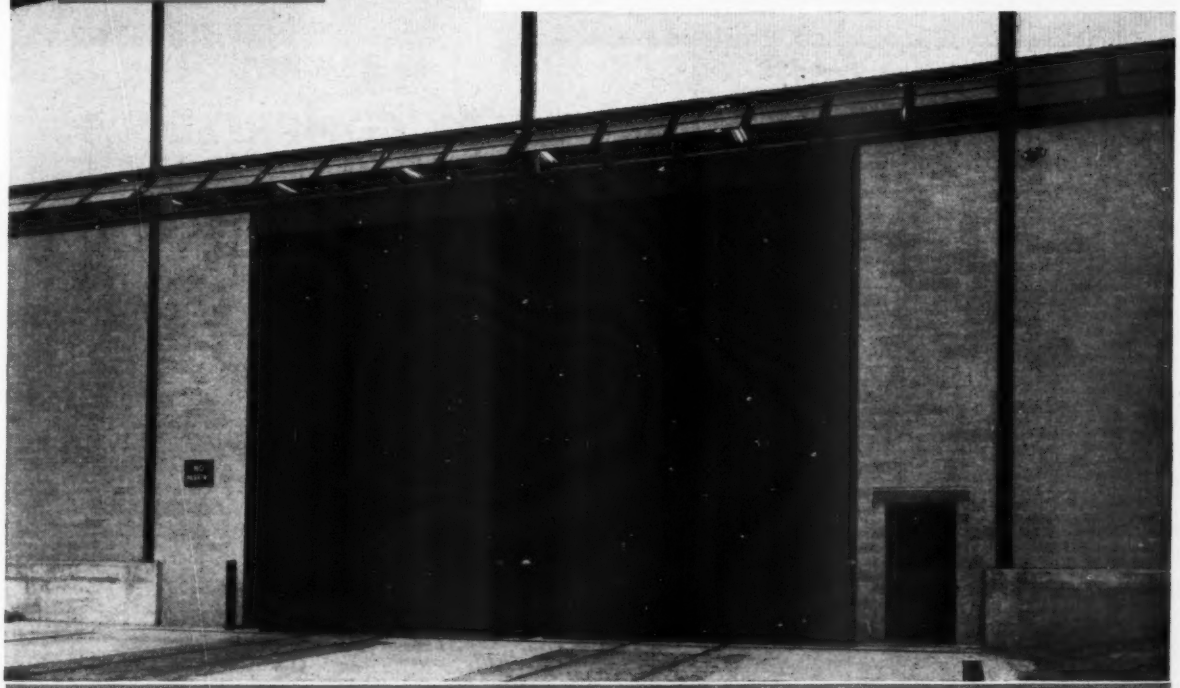

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Two Mahon Power Operated Rolling Steel Doors 17'-2" x 23'-0" installed in two railroad openings in Udylite Corporation's new plant in Detroit, Mich. O'Dell, Hewlett & Luckenbach, Architects. Barton-Malow Co., General Contractors.

# MAHON

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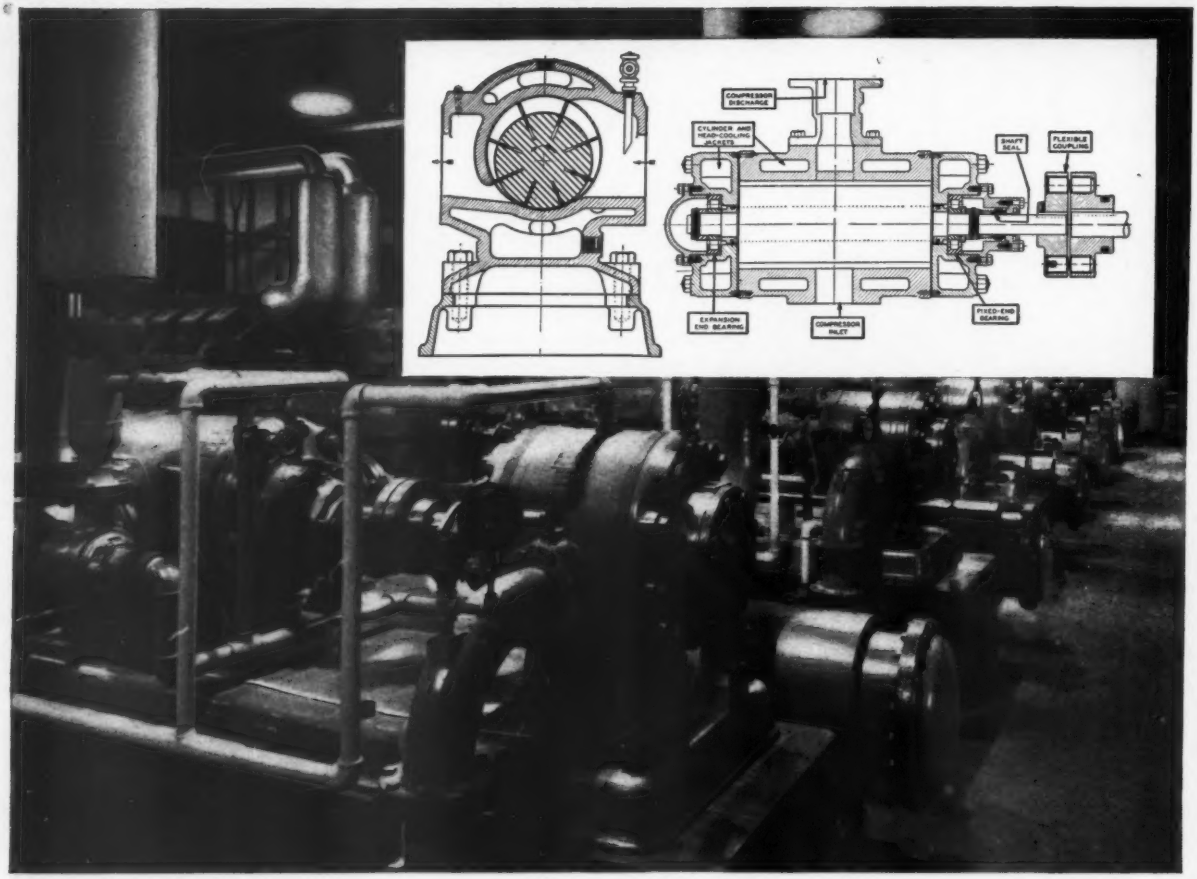


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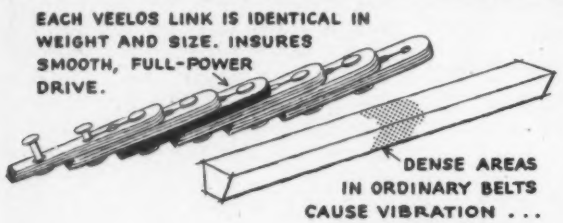
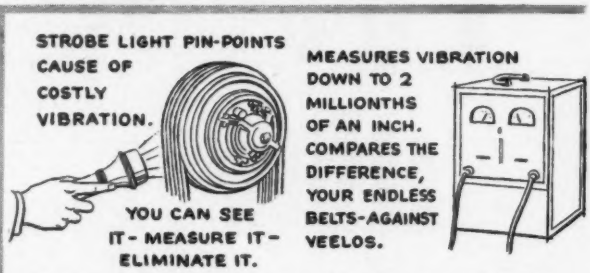

EACH VEELOS LINK IS IDENTICAL IN WEIGHT AND SIZE. INSURES SMOOTH, FULL-POWER DRIVE.
DENSE AREAS IN ORDINARY BELTS CAUSE VIBRATION . . . MACHINE WEAR

**1. Balanced construction** of Veelos Belts assures you faster, cleaner work, less rejects . . . less bearing wear. Each link and stud is identical in size and weight. Ordinary belts have varying spots of density which cause excess vibration—chatter marks, machine wear.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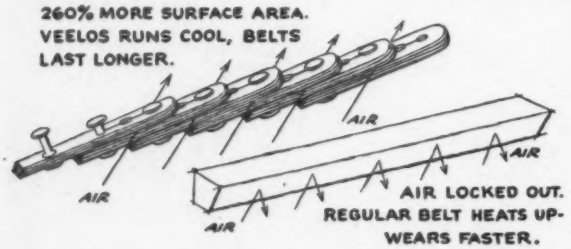
YOU CAN SEE IT - MEASURE IT - ELIMINATE IT.
MEASURES VIBRATION DOWN TO 2 MILLIONTHS OF AN INCH. COMPARES THE DIFFERENCE, YOUR ENDLESS BELTS-AGAINST VEELOS.

**2. Electronic proof**—up to 90% less vibration! With a vibration analyzer, you see, on your own machine, how Veelos belts decrease vibration up to 90% over any belt you're now using. This amazing Veelos test pin-points the belt that has the "invisible shakes."




**3. Cooler running—long life!** Veelos breathes! Constant circulation of air keeps Veelos running smooth. Regular V-belts have no chance to cool, heat builds up from the inside . . . causes slippage, wastes power, heats bearings, reduces belt life.

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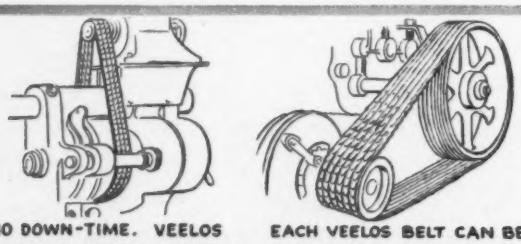
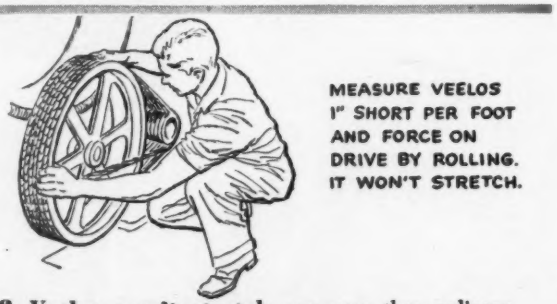
PERFECT VEELOS FIT. EXTRA THICKNESS AND MACHINE-CUT SIDES PREVENT BOTTOMING. MEAN CONSTANT POWER.
POWERLESS POINT CONTACT OF ORDINARY V-BELT. BULGES, SLIPS, CAUSES UNEVEN SHEAVE WEAR.

**4. Greater flexibility** reduces slippage! Sectional construction, beveled links allow greater flexibility, longer belt life. Each link moves around sheave independently and maintains full contact, constantly. Full area contact allows shorter centers, smaller sheaves.


NO DOWN-TIME. VEELOS FITS ANY DRIVE - WITHOUT DISMANTLING.
EACH VEELOS BELT CAN BE ADJUSTED - NO NEED FOR EXPENSIVE MATCHED SETS.

**5. Simple installation** "knocks out" down-time! Saves up to 50% installation time on outboard bearing drives, more when belt length isn't in stock. No resetting, tilting or moving motors. Veelos can be made any length, can be changed by adding or removing links.




**6. Veelos won't stretch** any more than ordinary endless V-belts when it is properly installed. *Remember—measure Veelos 1" short per foot and roll on drive as tightly as possible.* With the first few revolutions Veelos studs accept a permanent set into the sections they connect.

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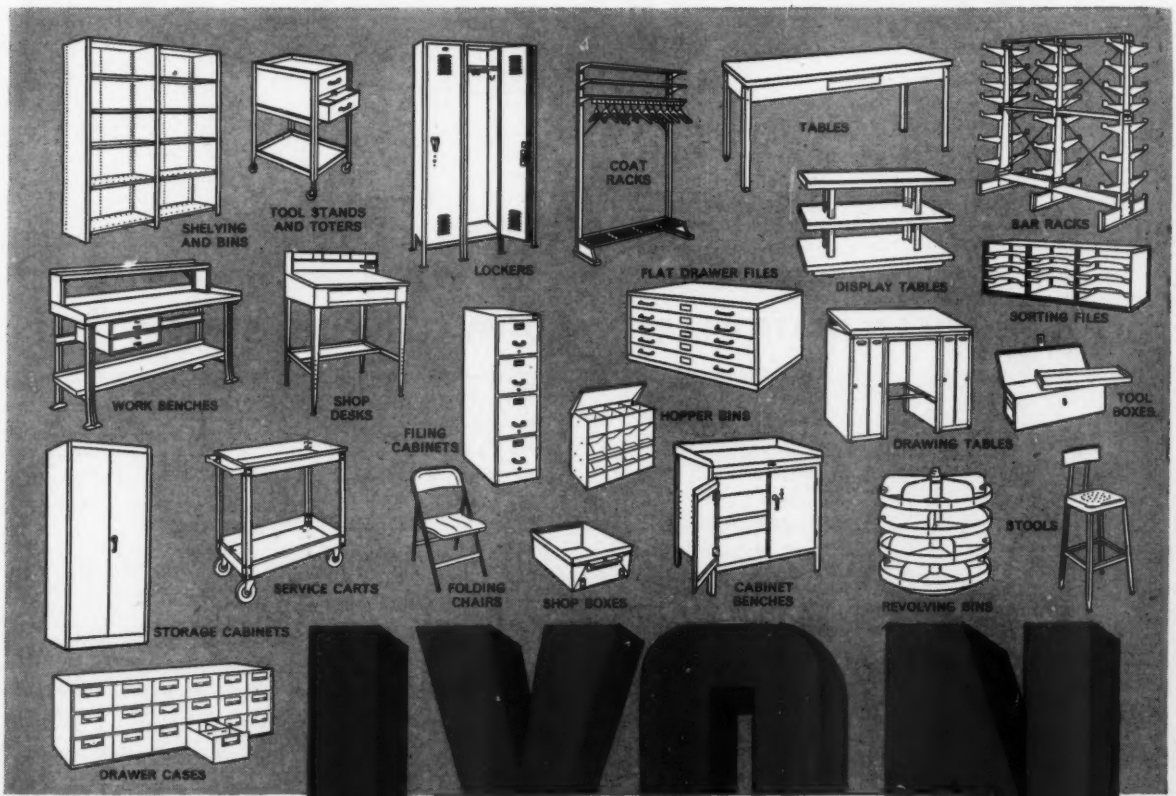


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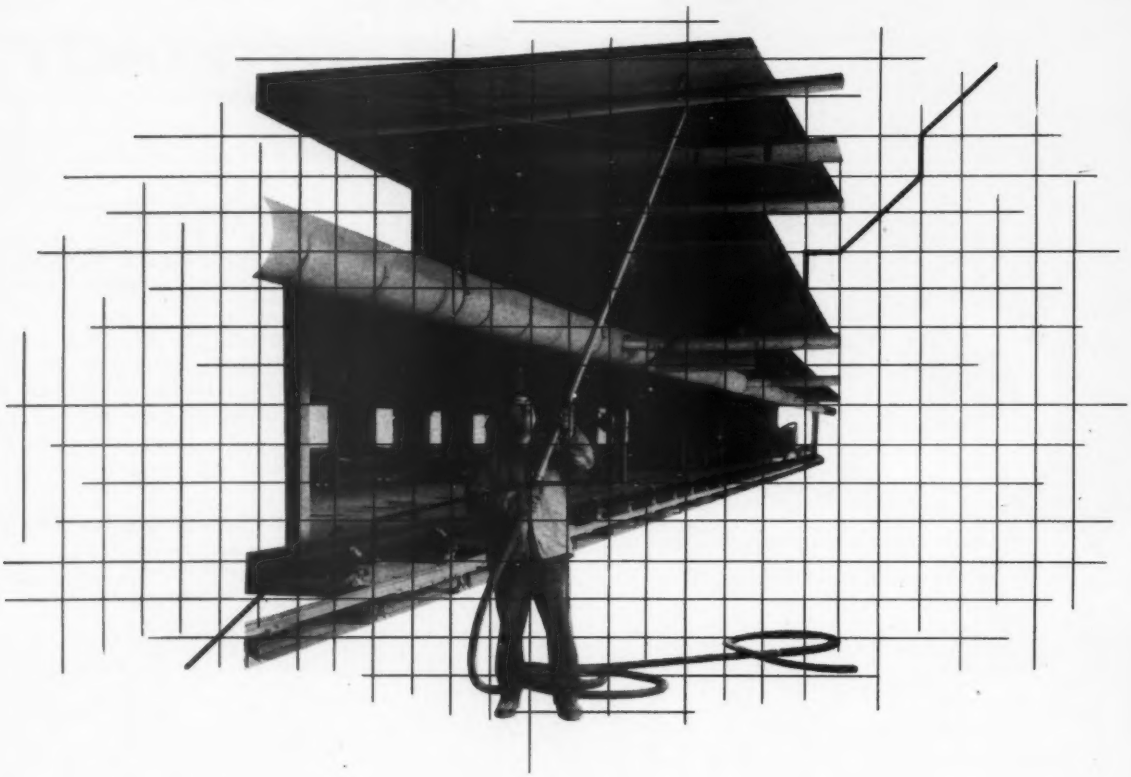

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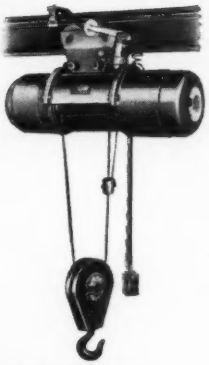
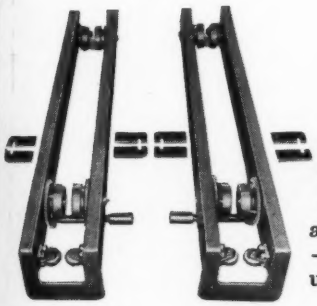


**SPEEDWAY ELECTRIC HOIST**

Available in Frame 1, 1½, 2 and 3 sizes with capacities from ¼ ton to 10 tons.

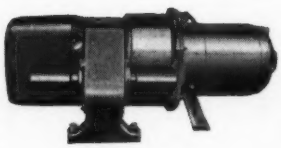


**END TRUCKS FOR ALL TYPES**

For motor-driven cranes and hand traveling cranes—both top running and under-hung types.

**CRANE DRIVE UNIT**

Designed for crane and double-beam trolley propulsion. Consists of an electric motor and a well-proportioned gear reduction. Size 1—with motors to 2 HP. Size 2—with 3 to 7½ HP motors.

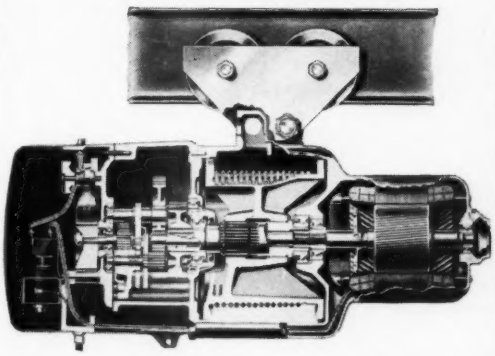


***for complete information on WRIGHT Hoists and Crane components ask for:***

***Speedway Hoists:*** *(Frame 1) Booklet DH133B, (Frame 2 & 3) Catalog E55A* • ***Motor Driven Cranes:*** *Underhung, Single Bridge, Bulletin #227; Top Running, Bulletins #DH448 or DH449* • ***Crane Drive Units:*** *Booklet DH-431A* • ***Hand Traveling Cranes:*** *Bulletins #DH-468 and #DH-348B*

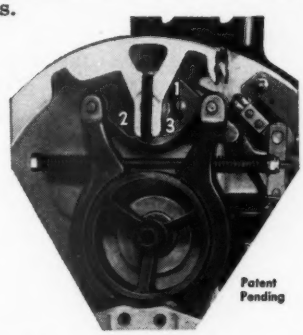
*Write our YORK, PA., office*

## LOOK FOR THESE QUALITY FEATURES



**Sound, generous, practical design**

Heavy duty design and fine balance assure users that WRIGHT *Speedway* Hoists will handle tough jobs on any duty cycle for which 30-minute NEMA motors are satisfactory. Wide gear faces and novel gear form insure extreme strength. All gears and pinions are alloy steel, heat-treated. Their ductile core supplies shock resistance to sustain service stresses.




**Nothing to adjust but the cam!**

Adjustment of this cam-actuated brake to compensate for brake lining wear is simple as ABC. When excessive load hook drift occurs...remove the screw shown at Position **1** (*see picture*), swing the cam until Position **2** is in line and replace the screw. That's all there is to it. For the final third of brake lining wear, set the cam at Position **3**. This is the only adjustment required. Brake springs and solenoid never need adjustment.

Better Value

ACCO

**Wright Hoist Division**
**AMERICAN CHAIN & CABLE**

York, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

(Advertisement)

# TIPS ON TRUCKS

## Records show electric trucks cost less to maintain

Electric trucks . . . or gas trucks? Which should you choose? Which should you use?

Where a choice of gas or electric trucks exists, it is wise to choose the electrically powered type. Facts show that except under the most abnormal conditions of outdoor operation, and where the trucks will be subjected to excessive abuse, your electric trucks will outperform the gas trucks practically every time.

Wherever records have been kept, it is interesting to observe that electric trucks, on the average, are available for duty longer. Downtime with electrics is held to a bare minimum. According to the logs, downtime and maintenance costs for gas trucks run two, three, even four times that of electrics.

## The right type battery can make a big difference

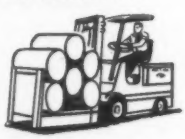
An electric truck is built to deliver more value per dollar—right from initial purchase, through every day of its long worklife. But to get the most out of the modern electric truck, it takes a modern "power plant" as well.

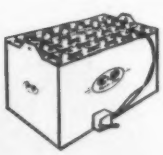
For best all-'round performance, it pays to match the better truck with the better storage battery—C & D. Here's an advanced-type storage battery built by the company which pioneered the modern storage battery. C & D *Slyver-Clad*® batteries virtually eliminate 'shedding' as a determining factor in battery life . . . are designed to give a minimum 10 percent greater capacity in standard size trays.

*(Send for the literature offered in the advertisement at right.)*

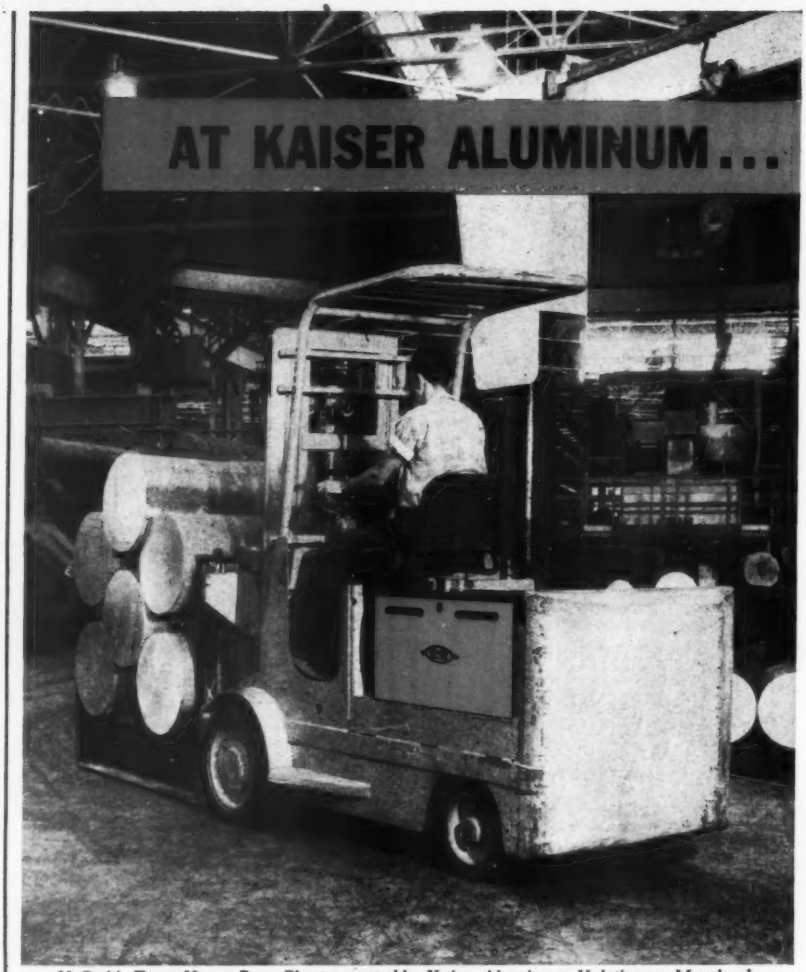
**For peak performance . . .**

match the best in trucks — electric





. . . with the best in batteries—C & D.




U. S. Air Force Heavy Press Plant operated by Kaiser Aluminum, Halethorpe, Maryland.

# Log many miles, low maintenance, lugging aluminum "logs" to press

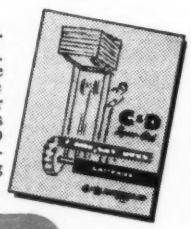
**Trucks all electric . . . batteries by C & D**

*Modern* is the word for Kaiser Aluminum's operation of the impressive new Air Force Heavy Press Plant here in Halethorpe, Maryland. Modern right down to materials handling!

It's a continuous haul, back and forth, from billet casting to the huge extrusion presses. The fleet delivers tons of aluminum every day. But power-packed C & D *Slyver-Clad*® batteries — the advanced-design truck batteries that give you a minimum 10% *extra* capacity in standard-size trays—provide power to spare during the full 8-hour shift.

It's true! Trucks work longer . . . stronger . . . with C & D batteries aboard!

**Why C&D? Write for—** New Bulletin IT-524/56. Tells you how to get more work—through more battery—from all your electric trucks. Shows you why advanced C & D principles and construction keep handling costs down.



**C&D BATTERIES, INC.**

of Conshohocken, Pa.

Since 1906

Sales and service offices in principal cities from coast to coast

**For more facts circle 562 on Reply Card**

# 8th Plant Maintenance and Engineering Conference Program

*Statement by L. C. Morrow, General Chairman, Plant Maintenance and Engineering Conference.* "There are many reasons why a maintenance conference is significant at this time: The maintenance wage roll is going up—both in its total and in proportion to the wage rolls of other industry functions. Maintenance personnel is increasing — also both in total and relatively. More is being learned about methods of budgeting maintenance expenditures and determining maintenance costs. Yardsticks by which to measure the effectiveness of maintenance are being worked out. Scientific methods hitherto applied almost exclusively to management procedures now are being applied to maintenance operations. More top management executives are discovering that their net profit is influenced extensively by maintenance.

"Nothing is more important during this period of growth of the function than the exchange of ideas. Nowhere can the exchange be made in such magnitude as at this Conference."

**Monday, January 28, 10:30 a.m.**

**"Changing Requirements for Maintenance,"** *Speaker: Oliver S. York, Manager, Maintenance Engineering Section, Engineering Service Division, Engineering Department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.* "Increasing complexity of modern industry is changing requirements for maintenance. Maintenance costs are becoming a more significant ingredient of mill cost. These changing requirements foretell several basic needs: 1—The improved selection, training and up-grading of mechanics. 2—The need for improved tools and techniques. 3—The need for improved preventive and corrective maintenance programs. 4—The need for improved administration control of maintenance work."

**Monday, January 28, 7:00 p.m. (Concurrent Sessions)**

**"Preventive Maintenance, A Case Report,"** *Speaker: Fred M. Gross, Superintendent of Maintenance Department, Armco Steel Corporation, Ashland Works, Ashland, Ky.* "The history of the system of inspections as it is operated within the Ashland Works of Armco Steel Corporation, in Ashland, Kentucky, has thoroughly convinced the speaker that a sound program in preventive maintenance has its roots in a well balanced team of full time inspectors. The speaker describes this particular portion of the inspection program that has been instituted and operated in his plant."

**"Maintenance Cost Controls,"** *Speaker: Edmund C. Newton, Administrative Assistant, Mechanical Department, Point Breeze Refinery, Atlantic Refining Co., Philadelphia, Pa.* "Planning and scheduling organization at the Point Breeze Refinery of Atlantic Refining Company utilizes standard methods, the related job times, and cooperation as effective aids in improving manpower utilization and in lowering maintenance and construction costs."

**"Maintenance Shops,"** *Speaker: Arnold R. Jones, Assistant Superintendent, Mechanical Construction and Maintenance Department, Norton Co., Worcester, Mass.* "Organization of a maintenance department and the layout of a new Central Services Building will be explained in detail. Speaker will also describe construction details of building, methods of lighting. Coordination between maintenance and production will be discussed."

**"Maintaining Handling Equipment,"** *Speaker: John Bayuk, Plant Engineer, Lycoming Division, Avco Manufacturing Corp., Stratford, Conn.* "Maintenance of mobile materials handling equipment in the plant will be discussed. The functions of preventive maintenance including check lists, scheduled inspection cycles, lubrication and corrective maintenance records, required maintenance trades, shop equipment, and other problems will be discussed."

**"Painting,"** *Speaker: Joseph Bigos, Research Director, Steel Structures Painting Council, Pittsburgh, Pa.* "Practically all of the factors involved in the protection of steel structures will be discussed. Subjects ranging from the proper design to eliminate much of maintenance painting through correct painting cycles, paint selection, cleaning, etc., will be covered by the speaker."

**"Equipment Replacement Policies,"** *Speaker: Raymond I. Ruel, Staff Industrial Engineer, Chemical Divisions, Food Machinery & Chemical Corp., New York, N. Y.* "Speaker discusses compilation of cost data on obsolete equipment, discusses Profitability Index and how replacement investments can be compared with other types of investments. Speaker will describe how to calculate Profitability Index."

**"Labor Relations Where Union Labor is Employed,"** *Speaker: Bert Walter, Manager Industrial and Community Relations, Clark Equipment Co., Buchanan, Mich.* "Subject covered by speaker deals with relative comparisons and major differences in the way labor relations are conducted with, on one hand production workers, and on the other hand, with maintenance workers. Reference will be made to difference in wage scales and with inconsistencies in wage increases. Collective bargaining and grievance procedure will be covered."

**"Maintenance of Equipment Standards,"** *Speaker: H. A. Burns, Manager, Production Engineering and Shops, Ansco Division, General Aniline & Film Corp., Binghamton, N.Y.* "Formal written standards for maintenance and construction in modern industrial plants are necessary says speaker, and he discusses how these affect quality of product. Importance of keeping standards book up-to-date is stressed."

**"Maintaining Electrical Distribution Equipment,"** *Speaker: H. E. Heddesheimer, Consultant, Electrical Engineering, Plant Engineering and Maintenance Services, General Electric Co., Schenectady, N.Y.* "This speaker's paper will call attention to and discuss the ever-increasing importance of power service continuity in an industrial plant. Also discussed will be details of various components involved and what should be done to insure their effective maintenance leading to dependability of operation."

**"Role of Lubrication in Preventive Maintenance,"** *Speaker: Robert Q. Sharpe, Oil Industry Information Committee, American Petroleum Institute, New York, N. Y.* "Preventive maintenance and its objectives are defined. Steps to be taken in designing a lubrication program for a plant are discussed. Examples are presented showing what can be done to fit an improved lubrication program into preventive maintenance."

**Tuesday, January 29, 9:30 a.m. (Concurrent Sessions)**

**"Organization, A Case Report,"** *Speaker: Edward W. Sutton, Maintenance Superintendent, Westvaco Chemical Division, Food Machinery & Chemical Corp., South Charleston, W. Va.* "Organization and function of maintenance department and responsibilities and objectives of the maintenance superintendent and his department and the functions of the foremen are discussed. Setting up of programs to reduce maintenance problems are stressed."

**"Yardsticks by Which to Measure Effectiveness of Maintenance,"** *Speaker: Capt. R. S. Stewart, Officer in Charge, Public Works Center, Naval Base, U.S. Navy, Norfolk, Va.* "This discussion will cover types of yardsticks applied to maintenance labor in order to measure maintenance costs, productivity of maintenance personnel and the effectiveness of the maintenance program. Also included are examples of monetary savings resulting from proper application of yardsticks."

**"Training and Education for Maintenance Personnel,"** *Speaker: Ralph G. Smith, Director, Maintenance Education, Assistant Director, Labor Relations, Dow Chemical Co.* "Paper will contain ideas on what industry can do to alleviate shortage of skilled workers and engineers; selecting engineers for maintenance and engineering departments; points to consider in establishing training programs for supervisory personnel; role of union in training activities."

**"Maintenance in Small Plants (50 or Fewer Maintenance Employees),"** *Speaker: William C. Wallin, Plant Engineering Chief, Plant Engineering Department, North Carolina Works, Western Electric Co., Winston-Salem, N.C.* "Firm control of maintenance offers all industry, says the speaker, an excellent challenge to lower its plant costs, both operating and production. Heart of the effectiveness of such a program is the development of a suitable paperwork system. Many systems fail because of complexity, inadequacy or disinterest."

**"Maintenance Welding,"** *Speaker: Vincent J. Richilano, Assistant Superintendent, Methods and Equipment and Maintenance, Cadillac Motor Car Division, Cleveland Ordnance Plant, General Motors Corp., Cleveland, Ohio.* "This speaker will present a talk on maintenance welding. This talk will undoubtedly stimulate thinking of maintenance and plant engineers in applying welding to all-around plant maintenance. Paper gives examples of service repairs, selection of jobs for welding, and welding equipment for general welding use."

**"Maintenance in Metal Working Plants,"** *Speaker: W. A. Irvine, Manager, Production Engineering, Maytag Co., Newton, Iowa.* "This speaker did not supply an abstract of his talk. From the title, however, we are assuming that the discussion will be limited to organization of the maintenance department at Maytag and emphasis placed on the maintenance of metal working equipment."

**"Maintenance in Chemical Plants,"** *Speaker: G. Standish Beebe, Plant Engineer, Chas. Pfizer & Co., Groton, Conn.* "The speaker's talk will involve the procuring and training of new help for the maintenance organization of Chas. Pfizer & Co. The speaker will also discuss the maintenance of mechanical stores, the work order system used at his plant, scheduling work, job priorities and centralized maintenance in this antibiotic manufacturing plant."

**"Maintenance in Steel Mills,"** *Speaker: John R. Lowey, Assistant Superintendent, Mechanical Department, Cleveland District, Republic Steel Corp., Cleveland, Ohio.* "Mr. Lowey, the speaker, was another who failed to supply information and a photograph. However, we assume that he will stress maintenance of heavy equipment and possibly point out the difficulty of maintaining equipment in steel mills due to the high corrosive action of the atmospheres prevalent in such industries."

**"Maintenance in Metal Fabricating Plants,"** *Speaker: Robert A. Melton, Divisional Plant Engineer, Stamping Division, Chrysler Corp., Detroit, Mich.* "Mr. Melton's discussion will stress maintenance of motors, purchase of new motors and punch press repairs. Another feature of the talk will be the use of ultrasonic testing and processes as a preventive maintenance measure. Also discussed will be maintenance records and budgets."

**"Maintenance in Foundries (Iron, Steel, Non-Ferrous),"** *Speaker: S. A. Simonson, Plant Engineer, Chicago Hardware Foundry Co., North Chicago, Ill.* "The speaker will discuss the mechanization and automation of equipment in the foundry field. This problem has complicated the maintenance problems in this industry and these problems will be discussed. Other topics will be inspection procedures, frequency, scheduling of repair work and lubrication."

**Tuesday, January 29, 3:00 p.m. (Concurrent Sessions)**

**"Getting Maintenance People to Work as a Team,"** *Speaker: Harold M. Sylvester, Special Assistant for Maintenance, Office of Assistant Secretary of Defense, Washington, D.C.* "The speaker, from his wide experience in the armed forces and private industry, points out the importance of selecting the right people for the right job, proper assignment of duties and the fixing of responsibility. He also stresses many unusual methods of obtaining cooperation and establishing a team work in the maintenance group."

**"Maintenance in Continuous Operation Plants,"** *Speaker: Joseph B. Littler, Plant Engineer, Durez Plastics Division, Hooker Electrochemical Co., North Tonawanda, N.Y.* "The paper discusses the problems of maintenance in a continuous phenol plant. Examples: Maintenance during actual production, inspections which can be made during operation, inspections at shutdowns, planning the shutdown work, standby equipment."

**"Sanitation with Particular Reference to Floors, Windows, and Washrooms,"** *Speaker: Ralph W. Woida, Department Superintendent, Building Maintenance Department, Tools and Maintenance Section, Allis-Chalmers Mfg. Co., Milwaukee, Wis.* "Mr. Woida will discuss building maintenance and industrial sanitation. He will place particular emphasis on the maintenance of floors, washrooms and windows. Importance of scheduling operations, the necessity for trial of new tools and supplies, cost control and safety measures will also be stressed."

**"Maintenance of Electrical Rotating Equipment and Controls,"** *Speaker: Arthur E. Goodwin, Development Superintendent, Motor and Control Division, Westinghouse Electric Corp., Buffalo, N.Y.* "Mr. Goodwin was another speaker who was unable to supply an abstract of his talk along with a photograph of himself. Here again, however, we assume that the title of his talk is fairly descriptive of its contents. It probably will cover motors, generators and other various types of rotating equipment along with electrical controls."

**"Planning and Scheduling, A Case Report,"** *Speaker: C. A. Monson, Staff Specialist. Mechanical Methods and Planning, Industrial Engineering Division, Procter & Gamble Co., Cincinnati, Ohio.* "This case report on planning and scheduling of maintenance work follows a typical repair request in one of the company's plants from its organization by production, to completion. A job involving three crafts is used to illustrate the line-staff team approach to maintenance."

**"Maintenance in Paper Mills and Product Plants,"** *Speaker: R. E. Johnson, Plant Engineer, Albemarle Paper Manufacturing Co., Richmond, Va.* "Mr. Johnson's paper will describe the plant maintenance and construction organization of his company. He will point out the effect that plant location and age of equipment has had in the development of that organization. The paper will also describe their improvements program."

**"Maintenance in Petroleum Refineries,"** *Speaker: Bert E. Newton, Maintenance Engineer, Ohio Oil Co., Robinson, Ill.* "This speaker will discuss procedures for initiation and authorization of work along with practices of his company in turnaround. The problems of protecting equipment and pipe against corrosion and other problems peculiar to refinery practice will be discussed. Chemical cleaning is also covered."

**"Maintenance in Rubber Mills and Product Plants,"** *Speaker: Richard T. Wise, Engineering Manager, Akron Tire Plant, B. F. Goodrich Co., Akron, Ohio.* "This paper presents a composite picture of equipment maintenance in five tire plants. It summarizes troubles that have occurred and corrective action taken on major items of equipment. Outlined also are three major problems experienced in maintenance operations of his company."

**"Maintenance in Food Processing Plants,"** *Speaker: Charles H. Pelton, Chief Chemical Engineer, Clinton Corn Processing Co., Division, Standard Brands, Inc., Clinton, Iowa.* "Mr. Pelton's paper deals with the corrosion problems—particularly those of equipment—incurred in the manufacturing of food products in a large wet milling plant. The service life of various materials of construction in this specific environment is discussed."

**"Maintenance in Textile Mills,"** *Speaker: R. V. Ott, Maintenance Engineer, Celanese Corp. of America, Narrows, Va.* "This paper describes the need and advantages of planning and application of basic controls in maintenance of textile plants. Problems in planning, scheduling, record keeping, etc., are described and their solution outlined. A formula is developed for determining extent to which preventive maintenance should be used."

On Wednesday, January 30th, starting at 9:30 A. M., all the Monday evening sessions will be repeated. On the same day, starting at 7:00 P. M., there will be concurrent sessions during which the first five sessions of Tuesday morning and the first five sessions of Tuesday afternoon will be repeated.

**Steel bands holding up aluminum faced insulation at Syracuse plant of Speno Railroad Ballast Cleaning Company**

# Drop the Ceiling and Heating Costs Too

## Insulation Laid on Steel Band Criss-Cross Does Low-Cost Job

HOW MUCH DOES it cost to heat a ceiling? That's what Speno Railroad Ballast Cleaning Company of Syracuse, N. Y. wanted to know. This article tells what they discovered and what they did about it.

Speno recently moved into a high-ceilinged locomotive repair shop which they had leased. Heating equipment consisted of three 750,000 Btu oil burning heating units. These units were, according to M. J. Speno, ". . . running nearly all the time and the building was still not warm." They were always low on oil and the fuel bill for 18 days, from Nov. 15 to Dec. 3, was $287.56.

Insulation appeared to be the answer but, inasmuch as Speno was only leasing the building it didn't want to invest a great deal of money in someone else's property.

Investigation showed that there was no insulation in the roof of the building. However, it would have been a difficult job to install any kind of insulation due to the roof trusses and considerable piping which criss-crossed the roof area.

Final decision was to insulate across the bottom chords of the trusses. Working height of the company's equipment did not involve the space above the trusses so there was little point in heating this unused area.

First job was to install a network of steel banding stretched across the lower chord of the wood trusses and nailed to them for support. This network is easily visible in the photo. In the resulting network no span of steel banding was more than 30 ft long.

Tightening of the bands was accomplished by first fastening two pieces of banding opposite each other on the outside trusses of the building. The loose ends were then brought together near the center and were tightened and fastened by using a band tensioner. When all the bands had been installed parallel to each other the length of the building, 46 in. apart, the operation was repeated and another series of bands at 90 deg to the first series completed a grid pattern composed of 46-in. squares of steel banding. Installation was made by Industrial Supply Co.

An aluminum foil-faced insulation called Ultralite was then rolled out over the steel band network in 48-in. wide continuous strips. The aluminum vapor barrier covering of the insulation formed a 2-in. tab along one edge of the insulation. These tabs were cemented to the adjoining blanket to make the entire insulation installation a one-piece blanket. The insulation was 1 in. thick. Cost: 23 cents per sq ft for a total of $5000.

According to a report released by M. J. Speno: "After the insulation was installed we kept an accurate record of oil used and, in an 18 day period we used 1,215 gal[1] as against 2,054 before insulating. This represents a savings of 67.5 gal per day or a total of 839 gal. This amounts to $109.46 savings. At this rate we have calculated that the installation should pay for itself in 28 months."

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[1] It is difficult to assess the exact savings inasmuch as the consumption was not calculated on a degree-day basis but only on a numerical day basis. The actual savings may have been less but probably it was greater because winter was more advanced during the second period of measurement.

**Introducing the Author:**

George E. Wralstad, Manager of Plant Facilities and Maintenance at the General Electric Company's Small Integral Motor Department in Fort Wayne, Indiana is a registered professional engineer. He attended the University of North Dakota and the Indiana Technical College and holds a B.S. Ae. degree. In addition, he has taken special courses in maintenance engineering at Yale and Purdue Universities.

The year 1941 marked the start of his plant engineering career. Military service followed and in 1945 he was discharged with the grade of captain. The same year he rejoined GE and in 1953 became supervisor of plant engineering of the General Purpose Motor Department in Fort Wayne. In 1955 he advanced to his present position.

# "Engineered" Maintenance Is Better, 10 Ways

## Doubles Output, Cuts Overtime, Provides Basis for PM Program at GE

**By GEORGE E. WRALSTAD, Manager of Plant Facilities and Maintenance, Small Integral Motor Dept., General Electric Co., Fort Wayne, Ind.**

AN EVER INCREASING number of machine breakdowns and man-made emergencies, causing failure in production output and high cost of maintenance, led us to the development of our controlled and engineered maintenance system.

The major differences of our system as compared to others are:

1. It is applied to both maintenance and tool room operations.
2. All expenses are committed prior to actual expenditures.
3. Depending upon the equipment available, the paperwork can be done either manually or by machine.

It is our objective to control all expenditures, either in maintenance or tool room operations, so that we can be sure to spend only authorized moneys and also to obtain data for preventive maintenance system.

Through this system, unbelievable accomplishments have been made in a very short span of time. We have:

1. Doubled the die cast output.
2. Increased production in machining areas where machines downtime paced output.
3. More than doubled the output of our dies over the rate prevailing 12 months ago.
4. Reduced overtime by decreasing man-made emergencies.
5. Compiled data to be used for a preventive maintenance system.
6. Established a preventive maintenance program.
7. Controlled costs prior to expenditures.
8. Stabilized our labor load.
9. Forced better planning, engineering and scheduling.
10. Operating cost information available to us in the maintenance and facilities section. Therefore, we can adjust our expenditures up or down based on production requirements with a direct reflection on profit and loss.

The following is one of two basic operations of our system; the other is explained later in the article:

Emergency maintenance is handled through our dispatching center and job ticket system. This spots improper maintenance, abuse of equipment, and design weaknesses. It delegates all of the "bookwork" to a central clerk and relieves the maintenance or tool room man of this responsibility.

To explain this procedure more effectively, a hypothetical case is presented. At 9:42 a.m. the foreman of the die cast area, is notified of an electrical failure in the control panel of one of the vertical die cast machines. He dials 206, our dispatching center's telephone extension number, for emergency maintenance, giving the location of the machine, machine number, and

**Fig. 1. Rows of call board bins nicely break down jobs into three categories**

the nature of the trouble, along with his name and section.

The dispatcher records this information on a 3 in. by 7 in. labor voucher, (see Fig. 2) with a job serial number and the appropriate shop order number and indicates the date and time the call is received, before placing the ticket on the call board. A letter preceding the job number designates the week. The numbers run in sequence for a week and then start over when the letter changes. The dispatcher then places the same information, including the time the job is assigned, on the daily call sheet, (GPM-494). The call sheet is a running log kept of all incoming maintenance calls.

In the call board set-up, we use a group of bins, Fig. 1. Each bin is marked according to crafts (electricians, machinists, tool room, etc.) Each craft is divided into three different categories: 1. jobs to be done, 2. jobs being done, 3. jobs finished.

## Use of Light Signals

If an electrician is not available in the immediate vicinity to take care of the emergency reported by the foreman, his light code is illuminated by the dispatcher on one of the signal panels which we have located at various points throughout the plant.

After an electrician who is in the field sees his light signal on the panel, he calls the dispatcher from a convenient place. The dispatcher informs him of the trouble reported by the foreman, its location, the serial number, and then places the electrician's name on the job ticket. The dispatcher punches the ticket in the time clock which registers the time the job was assigned and then places the ticket on the call board under "electricians" and in the row marked "jobs being done."

In case the electrician finds that the job is a large one, or requires the help of another type of craftsman, he has such assistance available by calling extension 206, referring to the job serial number, and indicating his needs to the dispatcher.

## Job Handling

The regular crew will do the work if the job is an extensive one. This eliminates tying up all the trouble-shooters and leaves them free to answer other calls. If such is the case, the job will be placed on the regular foreman's schedule and will be given top priority.

To get the help of another type of craftsman, the dispatcher calls him by using the signal panel and assigns him to the job in the same way as the electrician. The serial number remains the same but is followed by an alphabetical letter for each successive crafts-

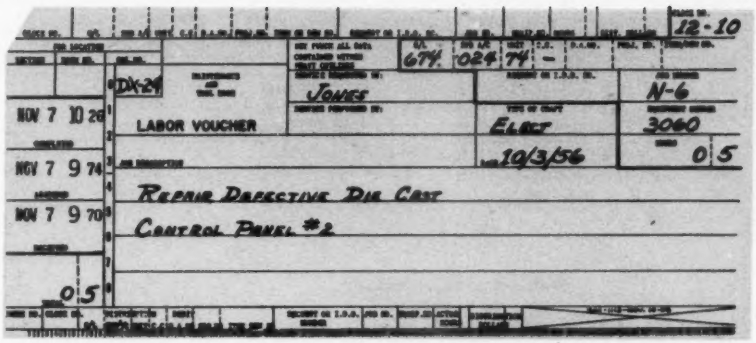



Fig. 2. This is the type of tickets used by the dispatcher on the call board

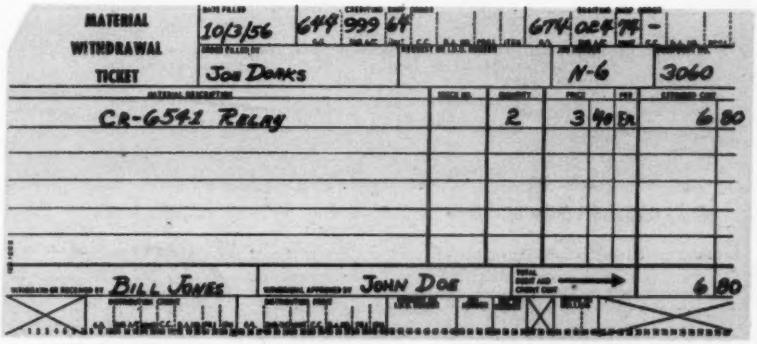



Fig. 3. Material drawn from the stock room is recorded on this kind of form

Fig. 4. A project engineer prepares such an estimate for requesting section

FW-126(9-56)

PLANT ENGINEERING SECTION DETAIL ESTIMATE

PLAN. ENG. Ashworth
LOCATION Sect. 648
Rearrange Assembly Area
EST. NO. 648-542
REQ. NO.
APPRO. NO.

| ITEM | ACCT. NO. | DESCRIPTION | MAT'L. | LABOR | O'HEAD | TOTAL EXP. | TOTAL INV. |
|---|---|---|---|---|---|---|---|
| 1 | 6460 | Relocate the following machines | | | | | |
| | | 2 - Bench type arbor presses | | | | | |
| | | 2 - Air test fixtures | | | | | |
| | | 1 - Drill press | | | | | |
| | | 1 - Nameplate stamping machine | | | | | |
| | | 1 - Vise | | | | | |
| | | 1 - Shaft straightening fixture | | | | | |
| | | 1 - Air test tank | | | | | |
| | | 1 - Desk | | | | | |
| | | 12 - Benches | | | | | |
| | | 1 - Surface grinder | | | | | |
| | | 1 - Air grit machine | | | | | |
| | | 1 - Lapping machine | | | | | |
| | | 3 - Sections of shelving | 100 | 300 | 360 | 760 | |
| 2 | 6460 | Build guard for air grit machine | 10 | 80 | 24 | 54 | |
| 3 | 6460 | Build cover for lapping machine | 20 | 35 | 42 | 97 | |
| 4 | 6460 | Cut loose and move out 15 ft. of roller conveyor, 1 bench, 2 sections shelving | 5 | 45 | 54 | 104 | |
| | | DRAFTING | | | | | |
| | | ENGINEERING | | | | | |
| | | SUB TOTAL | 120 | 400 | 480 | 1015 | |
| | | CONTINGENCY % MAT'L. % LABOR | | | | | |
| | | | | | TOTALS | 1015 | |

CIVIL | ELECT. | MECH | VENT

ENGINEER A. Smith DATE 5-17-55
SIGNED PLANT ENGR. ESTIMATE SECTION DATE
GRAND TOTAL $ 1015.00
COST REDUCTION ☐ NO COST REDUCTION ☐
SHEET OF

REQUEST FOR MFG. PLANT EQUIPMENT— 4120
DEVELOPMENT—INDIRECT MFG. EXPENSE—MISC. 17744

Date: 5/18/55 | Request No.: T-648-245

| | | | |
|---|---|---|---|
| Engrg. Est. No. | Reqn. No. | $ | S.O. |
| Original Est. Cost | $ 1015.00 | Est. Tot. Prod. | $ | S.O. |
| Add'l of this Requisition | 0.00 | Annual Prod. | $ 1015.00 | S.O. 6460648 |
| Total | $ 1015.00 | Prod. Period | $ | S.O. |
| Firm Billing Price | | Net Est. Savings | $ | S.O. |

Replacement ☐: Improved Mfg. Methods ☐: Increased Capacity ☐: Plant Improvement ☐

Number and Condition of Tools on Hand or on Order

Requested By: J. J. Ashworth | For Sect. No. 648 | Department: GMF MOTORS - TS

THIS REQUEST COVERS:

Job No. → 7395

REARRANGE ASSEMBLY AREA

Please furnish labor and material to rearrange assembly area to include surface grinder, air grit and lapping machine in this area.

Above rearrangement to include items 1 through 4 per estimate A. Smith 648-942.

The rearrangement is necessary to more centrally locate equipment and manufacturing processes which are common only to the Type A motor.

Date wanted ..... Date Promised ..... Delivery Date to Be Furnished on .....

| Distribution and Copies Required | | | APPROVAL | DATE |
|---|---|---|---|---|
| | | | R. Logan | 5/23/55 |
| | | | C Shelps | 5/24/55 |
| | | | | |
| | | | | |
| | | | TYPE AND WRITE WITHIN BORDERS | |

**Fig. 5. Work request follows the approval of the labor and material estimate**

man required on that particular job. For example, if a second man was dispatched to help with the vertical die cast control panel, the serial number on his job ticket would be N-6-A.

For new parts required to remedy the trouble, the electrician uses a material withdrawal card (TB-1), which is obtained from the stock room, Fig. 3. The identifying entries on this card include the serial number, the section, and the machine number. The card carrying a record of materials used is forwarded to the "price file" where the price per unit, extended cost, and the total cost are entered on it. Then the card is given to the cost section.

## Time Logging

Upon completion of the job, the dispatcher is contacted by the trouble shooter. The work done on the machine is noted on the job ticket which is again punched in the time clock by the dispatcher indicating when the job was completed. The amount of time required to do the job is entered, and then the job ticket is placed under "electricians" in the row marked "jobs finished."

Total time for each job is entered on the daily call sheet. At the end of each day, the completed job tickets are forwarded to the cost section where they are charged against the section incurring the costs.

Perhaps in this case, a small amount of material was needed, and only thirty minutes time was consumed in repairing the defective machinery. The operating foreman is charged for this but he has been saved the expense of keeping two or three maintenance men in his area all the time. This system gives him service with economy.

It may be well to point out that filling out the job ticket the minute there is a request for emergency maintenance results in high accuracy. Also, with our system the maintenance man has a minimum of paperwork. This has been achieved by delegating that type of work to a central clerk who has, at all times, a simple, but complete file of information concerning the maintenance job.

## Not PM, Just Yardstick

Now you have a rough idea of how an emergency maintenance problem is handled by means of the call board dispatching system. This system is not for preventive maintenance, but merely provides an accurate record and measurement of what has happened and forms the basis for evaluating and instituting realistic preventive maintenance schedules.

By periodically reviewing labor work vouchers and material withdrawal cards, we can tell what preventive maintenance steps should be taken. Data on equipment also can be compiled by a punched-card system and sorted automatically.

| CRAFT | SHOP | FIELD |
|---|---|---|
| ELECTRICAL | | 20 |
| PLUMBING | | 87 |
| STEEL | | 20 |
| WELDER | | 20 |
| TINNER | | 40 |
| CARPENTER | | |
| MACHINIST | | |
| MASON | | |
| PAINTER | | |
| MOVER | | 40 |

ENGINEERING NOTICE

FINAL

JOB NO. 6921

LOCATION

Section 648

S. O. 6460-648

REQUEST NO. T-648-245

DATE 6-6-56

COPY: FILE

DESCRIPTION:

Rearrange Assembly Area

DRAWINGS:

P-8735094 For Guard
P-6472019 For Cover
Layout Sketch for relocation

MATERIAL:

GSAS-241-6481 - 2 - V-Belt Pulleys
Balance of material from Stock

REMARKS:

Please furnish labor and material to do the following:

1. Relocate the following machines with necessary services as indicated:

   2 Arbor presses, 2 Air Test Fixtures (1/2" air line), 1 Drill Press (440-V Power), 1 Nameplate Stamping Machine (110-V Power), 1 Vise, 1 Shaft Straightening Fixture, 1 Air Test Tank (1/2" air hose with quick disconnect), 1 desk, 12 Benches, 1 Surface Grinder (440-V Power), 1 air Grit Machine (440-V Power and 3/8" air line), 1 Lapping Machine (440-V Power) and 3 section of Shelving per above layout.

2. Fabricate and install guard for Air Grit Machine as per drawing #P-8735094.

3. Fabricate and install cover for Lapping Machine as per drawing #P-6472019.

PLANT ENGINEERING

4. Cut loose and move out to yard 15 ft. of roller conveyor, 1 bench and two sections of shelving.

BY A. Smith
ENGINEER PHONE

**Fig. 6. Engineering notice covering job is prepared by the project engineer**

The second step of our operation covers the scheduling of normal maintenance, the tool room, construction, and preventive maintenance. To explain our second operation more effectively, again a hypothetical case was considered:

Assume, if you will, that Mfg. Section 648 desires to revamp one of the assembly areas. Such a large-scale operation requires the service of many crafts and possibly a great deal of new materials. Naturally, an estimate of labor and material is desirable. The responsibility of seeing that one is provided goes to the supervisor of plant engineering.

He assigns this task to a project engineer who analyzes the work and estimates the number of craft hours and materials required. This may be accomplished with the help of the interested foreman, or he may consult others.

The project engineer checks with the planner to be sure that the job is exactly what the planner wants, within the limits of good engineering practice and safety. He then submits a final estimate (FW-126), Fig. 4, covering all costs of labor and material.

## Request Route

If Section 648 accepts the estimate and the planning is final, it issues a request (AF-445) covering this project. See Fig. 5. The request is checked to see that it pertains exactly to the job covered by the estimate. The request is then routed to the manager of plant facilities and maintenance for approval.

As soon as the job is approved, it is assigned a job number by the material and labor control clerk. All future inquiries are made with reference to this number which also will be entered on every paper that is connected with this particular job.

Upon receipt of a copy of this request, the project engineer begins his work. Within two days, he sends written information to be inserted in the request folder including estimated completion dates for engineering and material ordering.

The project engineer prepares an engineering notice (FW-50), Fig. 6, to show the necessary engineering instructions, material requirements and specifications, and estimated labor requirements by craft. Non-stock material is specified on a request for material, for ordering purposes.

Upon receipt of the request from the duplicating section, the labor and material control clerk posts the job on the master load board showing the section's requested completion date. As soon as the information is available to this clerk, the engineering completion, material ordering, and availability

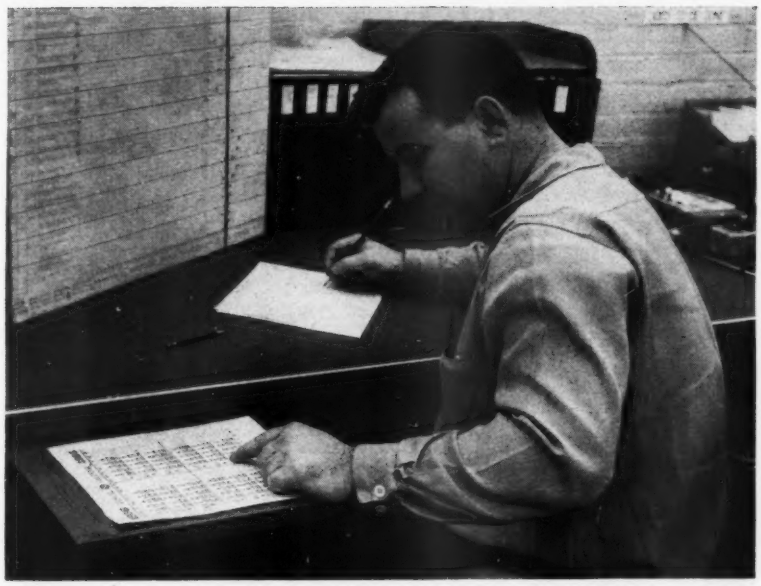


Fig. 7. Colored pins on master load board on desk indicate how jobs progress

CONTROL SHEET — JOB NO. 7395

TOTAL ESTIMATED MATERIALS $ 120 — TOTAL ESTIMATED LABOR HRS. 177

| ORDER NO. | DATE | DESCRIPTION | ESTIMATED COST | ACTUAL COST | RUNNING BALANCE | DATE | FRAMED | OPNS | BOR | FITTER | WELD | CODES | PAINT | HOURS | SECS | | RUNNING BALANCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6498 | 6/4 | 2 PULLEYS | 10 | 9 | 111 | | | | | | | | | | | | |
| | | | | | | 6/4 | 4 | 4 | 8 | | | | | 2 | 8 | | 151 |

Fig. 8. Control sheets carry daily balance of allowed time, material expenses

DESCRIPTION OF MATERIAL

Pipe

| CRAFT | ESTIMATED HOURS | ACTUAL HOURS |
|---|---|---|
| PLUMBING | 8 | 6 |
| MATERIAL | $6.00 | $5.00 |

TO: PLANT SERVICES SECTION, TAYLOR STREET

JOB LOCATION | SECTION | COLUMN | ROOM: M-6 | WORK ORDER NO. | SHOP ORDER NO: 674024-56-21 | JOB NO: 6602

DESCRIPTION OF WORK: MAKE NECESSARY REPAIRS ON VALVE #37 ON ANNEALING OVEN

EST COST $45.00

REQUESTED BY: Ashworth — DATE 10/1/56

ESTIMATED BY: Hoskin — DATE 10/2/56

ENGINEERING REQUIRED ☒ — APPROVED BY: Jones — DATE 10/3/56

Fig. 9. For jobs costing less than a hundred dollars work orders are written

WORK ORDER LOAD SHEET

| JOB NO. | AREA | JOB DESCRIPTION | ENGINEER | CRAFT HOURS: STEEL | PIPE | MACH | SHEET | ELECT | PLUMB | CARP | PAINT | MASON | MOVER | | TOTAL HOURS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1746 | 53 | MOVE TIME CLOCK | ALEXANDER | | | | | 6 | | | | | | | 6 |
| 1747 | 50 | MAKE (10) SUPPORT BRACKETS | STOSKOPF | | | | 2 | 10 | | | | | | | 12 |
| 1749 | 56 | MOUNT START SWITCH ON MOTOR FINISH | PAPIER | | | | 2 | 2 | | 2 | | | | | 6 |
| 1750 | 73 | INSTALL 110 OUTLET ON COL. M 27 | PAPIER | | | | | 5 | | | | | | | 5 |
| 1751 | 64 | REPAIR PEDESTAL GRINDER | ALEXANDER | | | | 2 | 4 | | | | | | | 6 |

**Fig. 10. A production control supervisor lists jobs generated by work orders**

MASTER SCHEDULE

| JOB NO. | AREA | JOB DESCRIPTION | ENGINEER | CRAFT HOURS: STEEL | PIPE | MACH | SHEET | ELECT | PLUMB | CARP | PAINT | MASON | MOVER | | TOTAL HOURS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7339 | M.E. | INSTALL LaBLOND LATHE | ALEXANDER | 1 | 1 | 4 | | 8 | 14 | | | | 8 | | 36 |
| 7300 | P.E. | INSTALL POWER LINES TO ELEVATOR | PAPIER | | | | | | 48 | | | | | | 48 |
| 7389 | G.P.T. | EXTEND DOCK ENCLOSURE | STOSKOPF | 32 | 16 | | | | 40 | 40 | | | | | 136 |
| 7315 | M.E. | ENLARGE OMNIWAY HERMETIC ROOM | PERRY | 4 | 4 | | | | | 8 | | 8 | 2 | | 26 |

**Fig. 11. Jobs are transferred from the load forms to weekly master schedules**

dates are posted on board. See Fig. 7.

The master load board shows the following: material and engineering situation, estimated completion date, when job is ready for construction, description, job number and project engineer.

After the material order acknowledgement is returned by the vendor, it is routed through the material and labor control clerk so that he can post the estimated material receiving dates for the job.

The clerk posts the quoted or estimated price for the non-stock material on the request control sheet. See Fig. 8. The quoted price is considered the actual price unless there is an unusual variation. However, in setting up the system, we found it well to post both the actual and estimated price until a comparison of the two provides a basis for considering the quoted price equal to the actual price.

When the master load board shows that all material, engineering, and drafting are complete, "request" information is ready to be entered on the master schedule in accordance with completion requirements and labor availability.

In addition to this, the material and labor control clerk prepares and maintains a request folder for each new request received. The request folder includes: an estimate, a request, a purchase order, a purchase order acknowledgement, engineering instructions and any other information applying to a specific request.

Work orders (GPM-111), Fig. 9, are issued for jobs costing less than one hundred dollars. All work orders are received by the supervisor of production control in my section, and given to the material and labor control clerk who assigns the job number. Those requiring an estimate are given to the supervisor of plant engineering. Cost plus or emergency jobs are scheduled immediately.

The supervisor of plant engineering screens the work orders to make sure that they do not exceed the one hundred dollar limit and require a request. He then assigns the job to a project engineer or, perhaps to a maintenance or tool room foreman if there is no engineering or non-stock material involved. The estimates are returned to the supervisor of production control and then to the sections.

If the section requiring work approves an estimate, the job is sent back to the supervisor of production control. The work order is given to the project engineer if engineering is not complete. He will issue the necessary engineering instructions and request for materials.

## Weekly Schedule

When the work orders are ready for construction, the supervisor of production control makes entries concerning them on a load sheet, (GPM-482), Fig. 10, which shows the following: area, description, estimated labor in hours per craft, job number and responsible project engineer.

After jobs on the work order load sheet have been placed on the weekly schedule, Fig. 11, they are crossed off the load sheet. The job is scheduled in accordance with completion requirements and material and labor availability. The master load schedule is revised if job requirements, or material, or labor availability change so that a realistic load schedule can be maintained at all times.

In making up the weekly schedule, (GPM-482), the supervisor of production control refers to two main sources,

FOREMAN'S DAILY SCHEDULE

Foreman JONES
Area 2
Date

| JOB DESCRIPTION | JOB NO. | WILLIAMS | COOK | FORD | JAKE | STARR | WESTON | HUNT | GRIFFIN | MYERS | GROSS | GREEN | KAMP | PROJECTED HOURS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REARRANGE ASSEMBLY AREA | 7395 | 0 4a | 4 4a | 0 6 | | 1 | | | | 4 2 | 0 8 | | | 149 |
| REPAIR VALVE ON ANNEALING OVEN | 6602 | | | | | | | 8 6 | | 1 | | | | 10 |
| REPAIR SLUG BELT REMOVAL SET. | 7562 | 4 | 4 | 4 | | 4 | | | | | | | | CP |

**Fig. 12. Production clerk contacts the foremen daily, prepares the daily schedules**

1—Craft scheduled to do work. 2—Craftsman who worked on job (entered by foreman). 3—Hours allowed for craftsman to do job. If foreman finds he has to make a change in the field, he has authority to do so providing item No. 5 is not upset and the production section is notified as soon as possible. 4—Hours expended by craft (entered by foreman). 5—Total hours remaining to complete job at time schedule is issued. Does not include scheduled hours. It is absolutely mandatory that this figure is not exceeded. 6—Emergency job (added to schedule, billed cost plus).

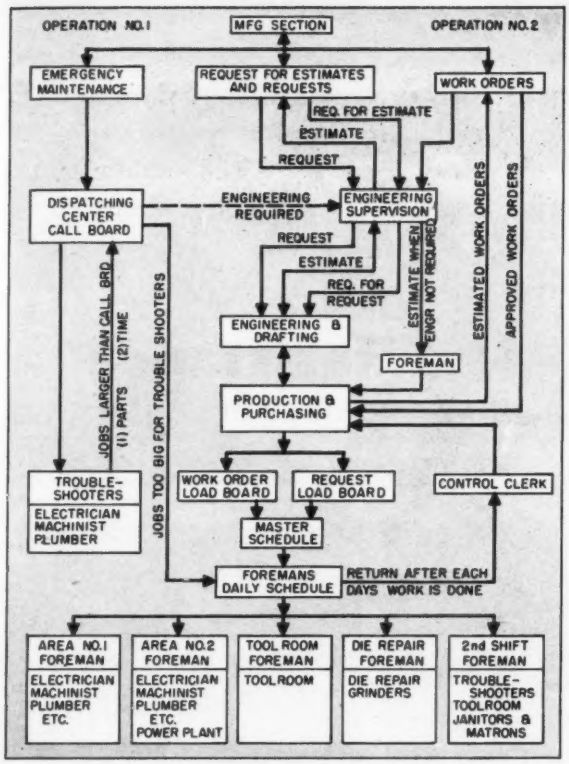



Fig. 13. Chart gives an overall picture of paperwork flow

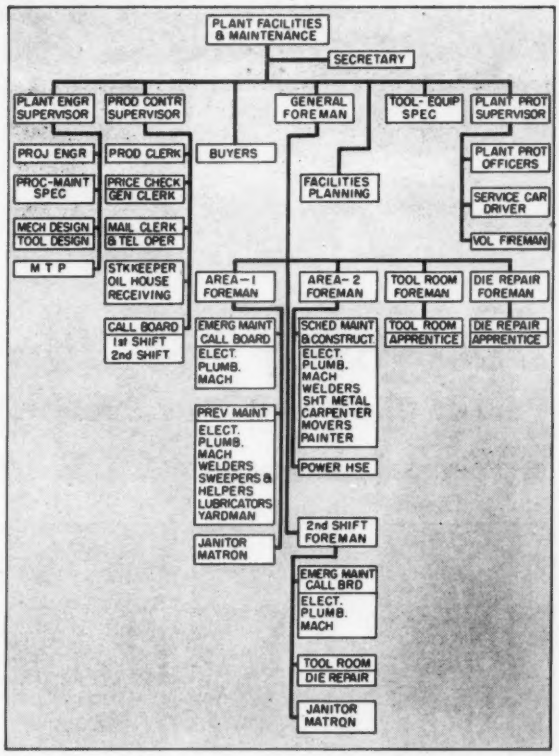



Fig. 14. Facilities and maintenance section's arrangement

the master load board and the work order load sheet. The schedule clerk makes the foremen's daily schedules using the weekly schedule as a guide.

The preparation of the master weekly schedule is done in close cooperation with the general foreman. The master schedule shows the following: job number, responsible project engineer, estimated labor in hours per craft and total hours, key jobs, short job description and area.

Before he makes out the foremen's daily schedules, Fig. 12, the production schedule clerk checks with the supervisor of production control on the status of the preferred jobs. He maintains daily contact with each maintenance or tool room foreman concerning their work loads.

## Job Control

The following explanation gives you an idea of how jobs are controlled: the material and labor control clerk keeps a record of the number of craft hours allotted for each project in a complete file of all active requests and work orders. At the end of each day, the actual hours worked are posted by crafts on the request control sheet, (GPM-566), or work order, (GPM-111). As long as the number of craft hours used does not exceed the number of craft hours allotted, the job is still available for rescheduling.

Finished daily schedules are sent to the call board dispatcher by the material and labor control clerk. The dispatcher makes out labor vouchers which are balanced daily against the clock cards, and idle time vouchers are issued to cover the difference.

Material expenditures are controlled by giving the stockman a list of job numbers on the daily schedule; he will issue material only for the jobs listed. When materjal is withdrawn, a material withdrawal card (TB-1) is filled out giving the quantity, description and price of each item. The card is routed to the material and labor control clerk who enters the amount spent on the control sheet. When the amount spent is equal to that estimated, the job number is crossed off the stockman's list; and no more material will be issued for that job.

When the time and money used reach 95 per cent of the estimated amounts, a "stop work" order is issued by the control clerk. The project engineer checks to see if the job can be finished in the remaining 5 per cent. If the job can be completed, the project engineer voids the stop work order, and work is continued under the regular procedure. If the job cannot be completed, the project engineer estimates the amount needed.

If additional money is required and approved, the work will continue. If the additional money is not approved, the work will stop when the initial amount has been spent.

To avoid actual work stoppage, the whole procedure from the time the clerk issues the stop work order until any appropriate decision is made should be carried out as fast as possible. The 5 per cent margin should allow enough time to get an approval before the crew actually leaves the job.

In spite of close material and labor control combined with a minimum of paper work, this system will not run itself. It is not the purpose of this system to remove all need for judgment on the part of the operating personnel. However, it does provide a functional guide for standard operation.

Controlled and engineered maintenance provides accurate records of all emergency and scheduled maintenance which can be used as a guide in determining machinery productivity and when profit-robbing machines should be replaced. The exact method of estimating all jobs regardless of size results in accurate control of costs before expenditures. Future labor loads can be forecast with greater stability.

The monetary worth of this system is beyond evaluation due to the extended life and increased output of the tooling and equipment.

Is your equipment properly protected against corrosion? . . . Have you considered surface conditions, temperature, dissimilar metal contact and stress? . . . The author elaborates on these factors and points out the advantages of . . .

# Designing for Corrosion Resistance

## Part I. Good and Bad Design Practices

By JOHN L. McPHERSON, Materials Engineer, Chemical Plants Division, Blaw-Knox Co.

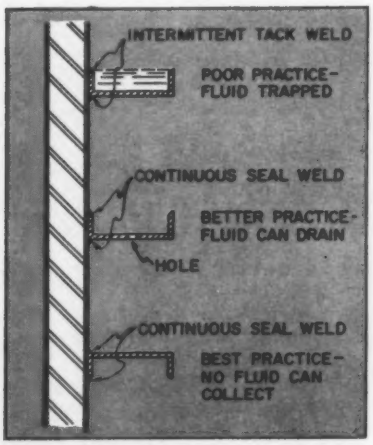



**Fig. 1. Structural members should always be placed with the open face down**

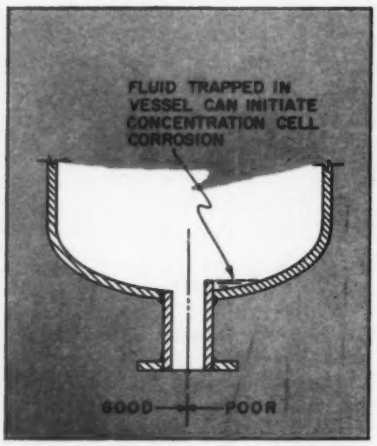



**Fig. 2. Fittings should be designed properly to prevent trapping of liquids**

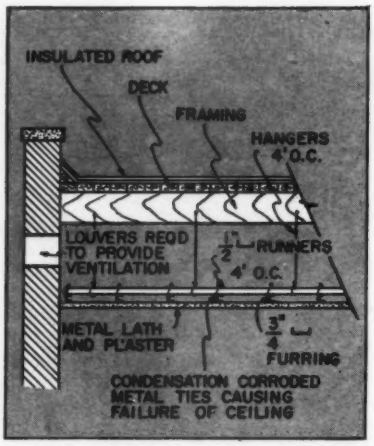



**Fig. 3. Condensation corroded metal ties, causing failure of false ceiling**

CORROSION WORKS quietly and treacherously, and without creating what appears to be an immediate problem. In more than a few plants, corrosion is the only full-time operation! Its destructive results are not felt immediately and, thus, cost control systems are seldom used to plot the cost building up through loss of equipment, spoiled products, shutdowns and higher replacement costs.

Corrosion control all too frequently consists only of a consideration of the environmental conditions to which a part, machine or structure will be subjected, and the material selected accordingly. To be completely thorough, design must be included as an important factor. Good design considers corrosion resistance secondary only to that for structural stability. No matter what merit a design may possess structurally, it will fail to fulfill its usefulness if resistance to corrosion can not be maintained throughout the desired service life.

A full understanding of how design relates to corrosion control can be obtained by dividing the subject into such factors as: 1. Surface Conditions, 2. Temperature, 3. Dissimilar Metal Contact, 4. Stress, 5. Metallurgical Contributions, 6. Weld Characteristics and 7. Effect of Minor Impurities. (The last three factors will be discussed in the second article.) This will show how certain design, fabrication and operating practices contribute to one or more forms of corrosion, and how they can be avoided.

**Surface Conditions** — The surface condition of a metal has considerable bearing upon its corrosion resistance. In general, a smooth surface furnishes greater resistance to corrosion than a rough one. It possesses fewer crevices and indentations which might induce

### About the Author

**John L. McPherson was graduated from West Virginia University with a B.S. in Chemical Engineering. A course in metallurgy with the I.C.S. and post graduate work in chemical and metallurgical engineering at the University of Cincinnati and the University of Pittsburgh completed his formal education. He is a professional engineer licensed by the State of West Virginia.**

**His work at Blaw-Knox consists of the checking of design for vessels and heat exchangers, designing, preparing specifications, checking mechanical equipment and preparing specifications for and selecting materials of construction for chemical-plant equipment.**

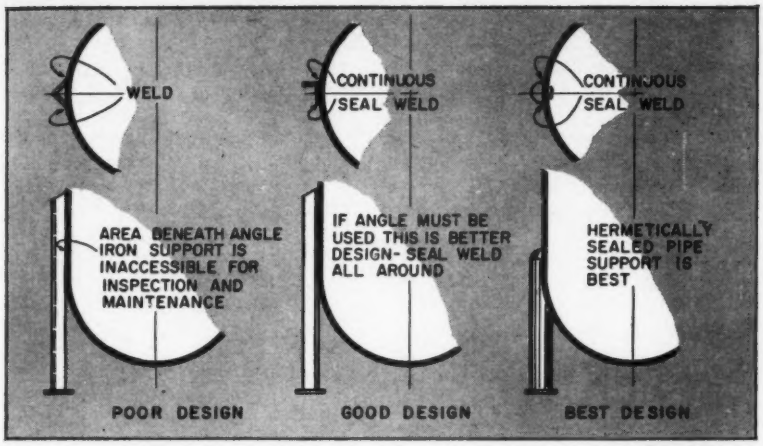

WELD
CONTINUOUS SEAL WELD
CONTINUOUS SEAL WELD
AREA BENEATH ANGLE IRON SUPPORT IS INACCESSIBLE FOR INSPECTION AND MAINTENANCE
IF ANGLE MUST BE USED THIS IS BETTER DESIGN- SEAL WELD ALL AROUND
HERMETICALLY SEALED PIPE SUPPORT IS BEST
POOR DESIGN
GOOD DESIGN
BEST DESIGN

**Fig. 4. Three different methods of supporting vertical vessels are illustrated. The hermetically sealed pipe is preferred to the two angle iron methods**

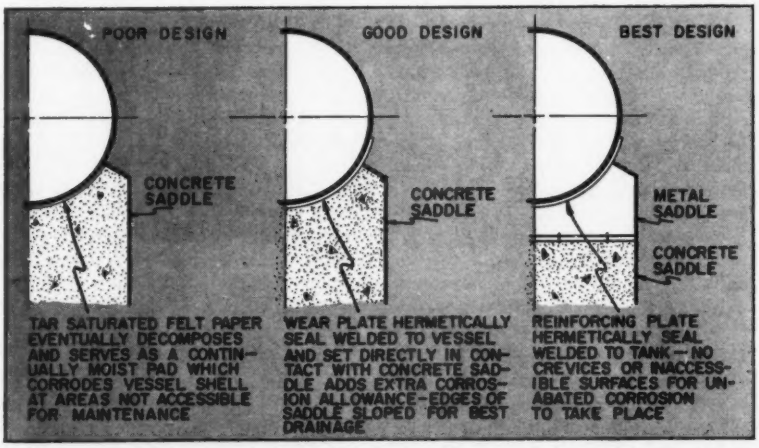

POOR DESIGN
GOOD DESIGN
BEST DESIGN
CONCRETE SADDLE
CONCRETE SADDLE
METAL SADDLE
CONCRETE SADDLE
TAR SATURATED FELT PAPER EVENTUALLY DECOMPOSES AND SERVES AS A CONTINUALLY MOIST PAD WHICH CORRODES VESSEL SHELL AT AREAS NOT ACCESSIBLE FOR MAINTENANCE
WEAR PLATE HERMETICALLY SEAL WELDED TO VESSEL AND SET DIRECTLY IN CONTACT WITH CONCRETE SADDLE ADDS EXTRA CORROSION ALLOWANCE—EDGES OF SADDLE SLOPED FOR BEST DRAINAGE
REINFORCING PLATE HERMETICALLY SEAL WELDED TO TANK—NO CREVICES OR INACCESSIBLE SURFACES FOR UNABATED CORROSION TO TAKE PLACE

**Fig. 5. For supporting horizontal tanks, illustration at right is considered best. Here, plate is welded to tank, leaving no space for possible corrosion**

concentration cell corrosion and furnishes less surface area on which attack may initiate. Certain metals, such as aluminum, lead and stainless steel, rely entirely upon the formation of a protective surface film for corrosion resistance. This film is more readily formed and maintained upon a smooth surface than upon a rough one.

Cleanliness of surfaces is of paramount importance. Corrosion is more likely to occur at inaccessible places where dirt and other porous solids can accumulate, than on areas that are kept clean. This is especially true in steel mills, soybean plants, fertilizer plants and other plants where dusting and soot are a problem. The equipment and structures in these plants can become covered with porous solids which absorb and retain moisture for long periods. These moist pads create differential aeration cell corrosion that can rapidly perforate the metal beneath them unless the surfaces are properly maintained and protected. Such exposed surfaces should be cleaned frequently, therefore, easy access must be provided for by the design.

In the design of equipment and structures exposed to moisture and aqueous solutions, good practice eliminates pockets and crevices where fluids can be trapped. Attachments should be designed to permit complete drainage, and faying surfaces of abutting component metal parts should be sealed by welding or caulking to prevent crevice corrosion.

Ledges and shelf-like projections that trap fluids can cause concentration cell corrosion. Structural shapes such as angles and channels, Fig. 1, should always be placed with the open face down so water and dirt cannot accumulate. If it is necessary to have the open face up, weep holes should be drilled in the web to facilitate drainage of fluids.

Since differential aeration cell corrosion is often initiated during idle periods of plant operation, all pipe lines, vessels and other processing equipment should be installed to permit complete drainage of corrosive fluids. Fittings, nozzles and connections in vessels and similar equipment should be designed and installed to prevent the trapping of liquids, Fig. 2.

## Faying Surfaces

Collars used as pipe-support hangers can cause corrosion of process piping. The faying surfaces between pipe and collar present a crevice where moisture can collect and remain for a long time during which localized corrosion occurs. Lugs or brackets welded to the pipe and fastened to the support hangars are a better design from a corrosion viewpoint. Improperly waterproofed pipeline insulation or breaks in the water-proofing membrane usually result in corrosion.

Contact of metal surfaces with porous nonmetallic materials such as wood, felt, cork, paper, cloth and asbestos should be avoided in wet and humid areas. When saturated with moisture, these materials encourage and support corrosion. Where such nonmetallic substances must be used as gaskets and expansion joint materials in building construction, they should be saturated with coal tar or asphaltic compounds. The faying surfaces of the metal should be protected with a suitable organic coating, and the joint exposed to the atmosphere should be sealed with a permanently flexible and adhesive caulking compound. Catalytic curing Thiokol and neoprene rubber caulking compounds are ideal for this application.

When designing buildings with false ceilings and panel walls, provide good ventilation in areas where moisture can condense during periods of rapid temperature change. Free air circulation permits the most rapid evaporation of condensed moisture. At least one failure of a suspended false ceiling can be traced to the omission of proper ventilation in the open space directly above the ceiling.

Corrosion of wire ties supporting metal lath and plaster, Fig. 3, resulted in dropping the entire ceiling in a 20- by 50-ft room. It was caused by condensation of moisture in the closed space during cool evenings. The condensed moisture leached sulphur compounds from the gypsum plaster to form an acidic solution, which rapidly attacked the wire at the air-plaster interface.

The design of supports for vessels is particularly important and should provide free drainage and air circulation to all exposed surfaces for the removal of water and corrosive fluids, as well as accessibility for periodic in-

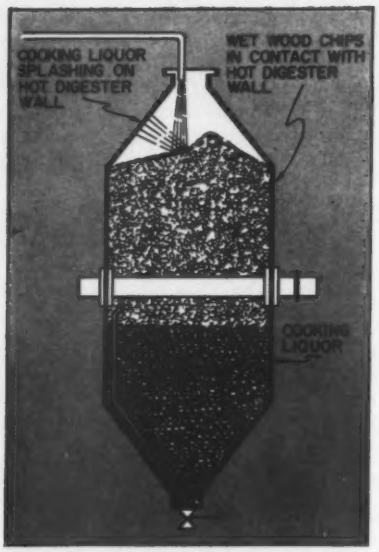



**Fig. 6. Corrosion of pulp digester is caused by liquor splashing on wall**

spection and maintenance. Figures 4 and 5 illustrate poor, good and best support design for vertical and horizontal vessels.

Placing the tank shell directly upon a concrete saddle is not good practice. Moisture can collect in the area between the metal and concrete and the vessel shell will corrode near the edge of its support. Failure of the vessel is further accelerated by abrasion of the shell as it rubs across the concrete during thermal expansion and contraction.

Sometimes coal tar or asphalt saturated felt is placed between the tank shell and the concrete saddle. This eliminates abrasion and reduces corrosion for a period of time, but eventually decomposition of the saturated felt occurs, and the pad then serves as a porous sponge to continually wet the metal surface. If a soft pad is used between the tank and its support a weather resisting material should be employed.

Good design practice provides a wear plate which serves as a corrosion allowance and extends the life of the vessel. This plate must be hermetically seal welded to the vessel. A better design is one where the tank is furnished with a metal saddle that is entirely seal welded to the shell. This eliminates localized corrosion of the shell and makes all exposed metal surfaces accessible for maintenance. All support surfaces should be sloped so water will drain freely.

**Temperature** — Temperature is a major factor in the corrosion of metals. Usually the higher the temperature the faster corrosion reactions take place. Keep the temperature of corrosive solutions as low as possible.

Metal surfaces used for heat transfer are often the site of localized corrosion brought about by a difference in surface temperature. In such equipment, good circulation of fluids should be provided to maintain as uniform a temperature distribution as possible. Vessels being heated or cooled through jacket walls should be provided with agitators so located that the fluid moves past the heat transfer surface at a uniform rate. This helps prevent corrosion caused by thermal gradients on the metal surface.

The splashing of corrosive liquids onto a hot metal surface can result in severe localized corrosion by what is termed hot-plate boiling. This occurs when small quantities of corrosive liquids are splashed onto a metal surface at elevated temperatures, usually above the boiling point of the liquid. The elevated temperature concentrates the small quantity of liquid and locally increases the corrosion rate.

Improper charging of wood chips and sulfate liquor resulted in localized corrosion of several stainless-steel-lined pulp digesters, Fig. 6. Another example of a corrosion failure known to have been caused by hot-plate boiling occurred with a stainless-steel vessel handling a nitric-acid solution. Partially immersed steam heating coils at a temperature of 280 F were perforated above the liquid level. The boiling solution sprayed small quantities of acid onto the coils where it concentrated and caused a pitting type corrosion which perforated the tube wall. The coils beneath the liquid level were as good as new.

## Heating Corrosive Fluids

Coils, reboilers and equipment used for heating corrosive fluids should be so designed that their hot surfaces are continually submerged and at a uniform temperature. Provision should be made for the detachment of gas bubbles from the hot surface to prevent localized overheating. This can best be accomplished by providing good circulation of the liquid.

**Dissimilar Metal Contact** — Frequently it is necessary to utilize dissimilar metals in the design of equipment and structures. Such use may lead to galvanic corrosion of one of the coupled metals unless special care is exercised. Whenever dissimilar metals are used, it is desirable to select combinations of metals that are as close together in the galvanic series as possible.

If metals from the same or adjacent groupings cannot be used, then the part having the smallest surface area should be fabricated from the most noble metal. Fastenings, valve trim,

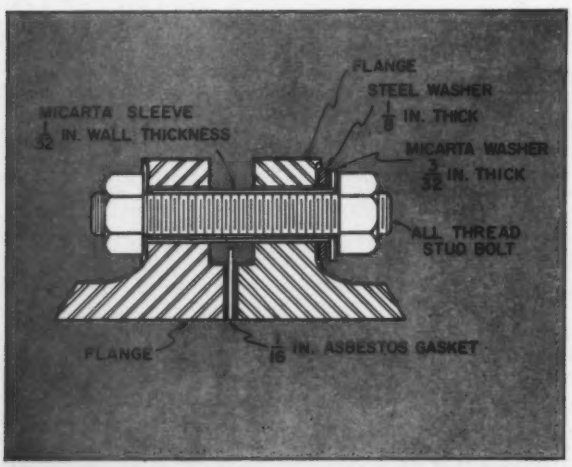



**Fig. 7. When it is not possible to use a more noble material for the part having the least surface area in a dissimilar-metal joint, electrically insulate one metal from the other**

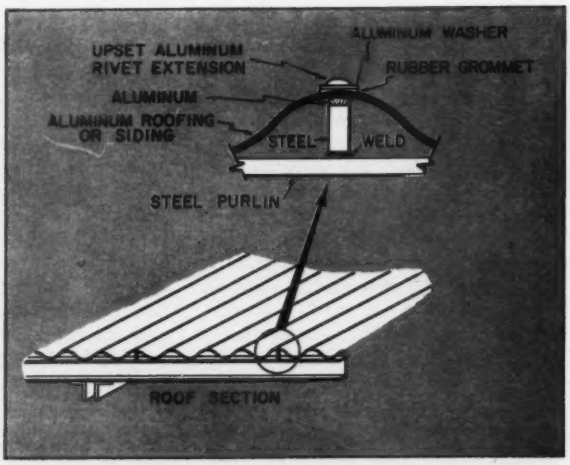



**Fig. 8. Galvanic corrosion is practically eliminated by using steel studs with aluminum shoulder inserts and rubber faced aluminum washers in attaching roofing to steel purlins**

pump-wear rings and other similar equipment parts should always be made from the most noble metal, since these parts always have the smallest surface area.

When it is not possible to use a more noble material for the part having the least surface area in a dissimilar-metal joint, or if the surface areas are almost equal, then it is desirable to electrically insulate one metal from the other. This will break the electric circuit and prevent corrosion. This method of preventing galvanic corrosion is frequently employed in pipe lines, Fig. 7. Electrical insulating flanges of this type are also valuable in preventing electrolysis where current leakage from an external source such as an electrified railroad, power stations and grounded electric equipment provide the impetus for corrosion.

## Galvanic Corrosion

An example of what can be done to protect against galvanic corrosion is shown in Fig. 8, which illustrates how aluminum roofing was attached to the steel framing of an industrial building. The supporting steel for the aluminum roof was painted with an aluminum filled bituminous coating, and the roofing attached to the purlins by special welding studs. The studs consisted of steel shells with aluminum shoulder inserts, and were stud welded to the steel purlins. The aluminum roof was then impaled over the aluminum shoulder rivets, a rubber faced aluminum washer was placed over the holes and the rivets upset to form water-tight joints. This method of attaching aluminum roof sheets to steel purlins practically eliminates the possibility of galvanic corrosion.

In laying out equipment such as vessels and pumps in a chemical plant, it is good practice to keep equipment constructed of dissimilar metals separated as far apart as possible. Complex galvanic cells may exist when adjacent vessels are fabricated from dissimilar metals widely separated in the galvanic series.

Figure 9 illustrates how corrosion of an aluminum tank was caused by a complex galvanic cell formed between it and an adjacent copper tank. Both vessels were supported by a common steel framework. In this instance, galvanic current could flow from the aluminum vessel through the electrolytic solution to the copper tank then back through the steel support to the aluminum tank. Corrosion of this type is rare since the electrolytic cell is weak, and galvanic attack can be mitigated if the equipment is well separated to increase the resistance of the electrical circuit.

Where galvanic corrosion occurs, even after taking all possible design and installation precautions, then cathodic protection can be applied. Cathodic protection of equipment can be obtained either by the application of an externally applied potential or the use of sacrificial anodes. Current from an external source is often used economically for the cathodic protection of buried pipelines and water-storage tanks. The metal to be protected is electrically connected to the negative terminal of a direct-current power supply. The positive terminal is connected to an anode, usually graphite, in the conduction liquid or soil. Current from the anode passes through the electrolyte to the protected metal surfaces making them cathodic to the anode and stopping corrosion currents.

Where the current is supplied by galvanic action between the protected metal and sacrificial anodes; zinc, aluminum, magnesium and their alloys are usually used. This method of protection is preferred for heat exchangers and equipment, where replaceable zinc anodes are readily employed. Figure 10 shows one method used to attach replaceable zinc anodes to steel tube sheets of an aluminum-tubed, water-cooled condenser. In this case cooling water was on the shell side and the zinc anodes were used to protect the aluminum against galvanic corrosion that might be caused by the steel-aluminum couple.

**Stress Considerations** — Stress has a definite influence on the corrosion of metals and deserves special consideration by the engineer. High tensile stresses resulting from forming and welding increase the rate of corrosion of metals in acid solutions and can cause unexpected failures. Cyclic stresses damage protective surface films and may lead to fatigue failure. Steady operating stresses of low magnitude seldom cause corrosion, but hidden residual stresses resulting from poor design and fabrication can cause stress corrosion cracking.

## Stress Can Cause Corrosion

The normally applied design stress is usually low and its effect on corrosion is of no consideration. However, locked-in stresses developed during forming and welding, as well as high localized stresses resulting from poor design, can accelerate the corrosion of metals exposed to highly corrosive acid solutions.

There is considerable data to substantiate that metals in compression have a lower solution potential and that metals in tension have a greater solution potential than unstressed metals. This variance in solution potential

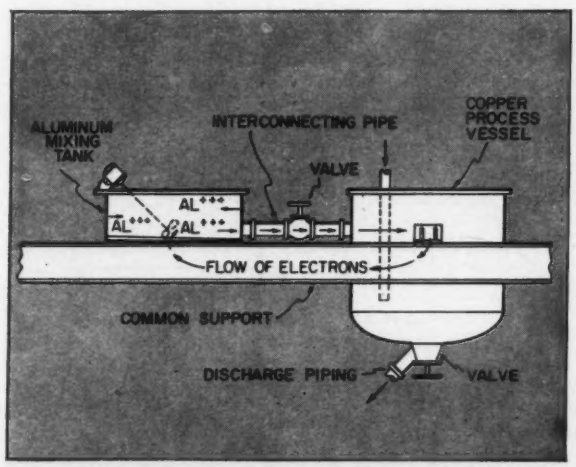



**Fig. 9. A complete galvanic cell can be set up by connecting an aluminum and copper tank through piping and steel supports, if the vessels contain an electrolytic solution**

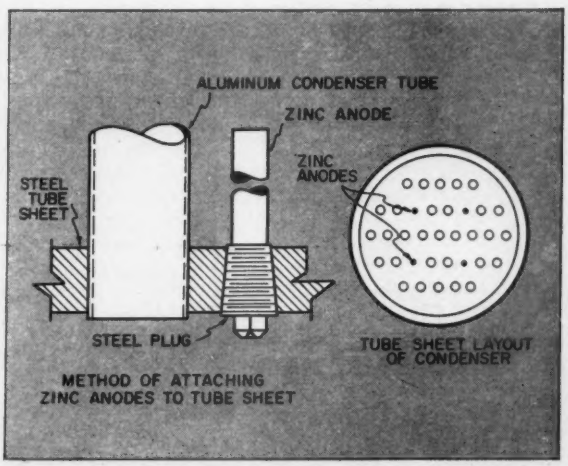



**Fig. 10. Where galvanic corrosion occurs, even after taking all possible design precautions, cathodic protection can be applied. One way to do this is to attach sacrificial anodes**

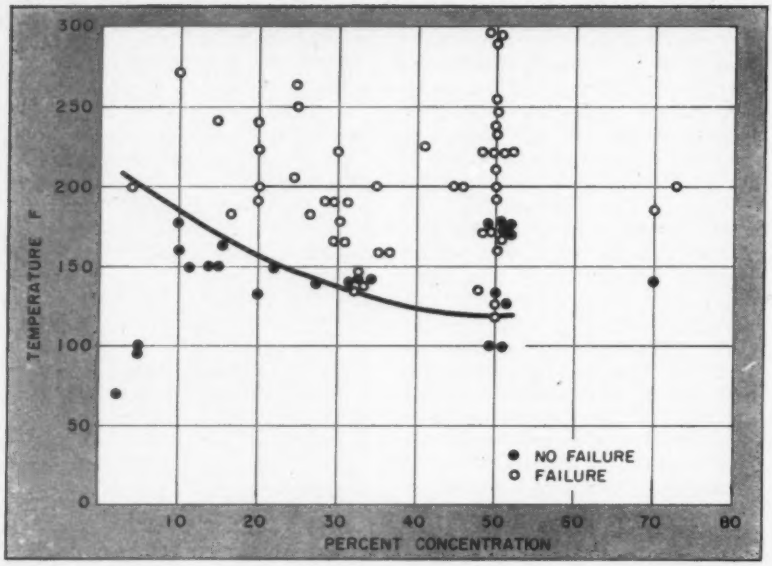



**Fig. 11. To produce caustic embrittlement, high concentrations of alkaline solutions at elevated temperature must be in contact with the acted-upon metal under high internal tensile stress. Curve relates to carbon and low alloy steels**

is the reason for the increase in corrosion of stressed metals. Where nonuniform residual or applied stresses exist, localized corrosion cells may be formed. As a result, pitting or trenching of the metal will occur at areas most highly stressed in tension.

An unusual example of accelerated corrosion caused by stress was observed in carbon-steel tumbling digesters. Used for producing kraft pulp, reliance was placed entirely upon the formation of a heavy calcium-carbonate scale for corrosion resistance. The revolving of the digester about stub trunnion shafts produced dynamic flexure stresses which damaged the passive scale and accelerated corrosion. In this case stress served in a secondary capacity, since it only initiated corrosion by damaging the passive surface film.

Stress corrosion cracking is the spontaneous failure of a metal or alloy as the result of the combined action of stress and corrosion. It produces two types of failures which can be classified as intergranular and transgranular cracking. Intergranular failure occurs when the cohesion between the crystallographic grains of a metal is reduced appreciably by chemical attack and cracking predominately follows the grain boundaries. Transgranular failure results when cleavage of the grains occur.

Caustic embrittlement of ferrous metals by alkaline solutions is probably the best known of stress corrosion. Experience has shown that to produce caustic embrittlement, high concentrations of alkaline solutions at elevated temperature must be in contact with the acted-upon metal under high internal tensile stress. A National Association of Corrosion Engineers report includes a curve relating temperature and caustic concentration to the cracking of carbon and low alloy steels, Fig. 11.

Equipment designed to handle caustic solutions under service conditions which fall above the failure demarcation line should be stress relieved to prevent cracking. Carbon-steel piping and equipment can be stress relieved by heating the metal at a temperature of 1100 to 1200 F for one hour per inch of metal thickness, then slowly cooling to ambient temperature. Where stress relieving cannot be employed nickel or a nickel alloy should be used.

One example of caustic embrittlement is the failure of a 50 per cent sodium hydroxide storage tank which was equipped with a steam heated coil for freeze protection. This vessel was not stress relieved, but provision was made for automatically controlling the temperature of the caustic to below 120 F. After about six months of successful operation, the automatic controls were disconnected and the temperature regulated manually.

Due to carelessness, the temperature of the caustic was permitted to rise to about 250 F for several hours. As a result, stress corrosion cracking of the vessel occurred at the longitudinal and circumferential weld seams, Fig. 12.

Another failure resulting from poor workmanship, Fig. 13, was a thermocouple connection in a steam traced carbon steel pipeline handling 50 per cent caustic soda at a temperature of about 125 F. The connection was made by burning a hole in the pipeline with an oxyacetylene torch and welding on a pipe coupling. The stresses set up by the burning and welding were sufficient to produce the cracking indicated. If the opening in the pipe had been drilled or machined so as to eliminate stress raisers the cracking may not have occurred. Or, if the assembly had been stress relieved after welding, cracking would not occur.

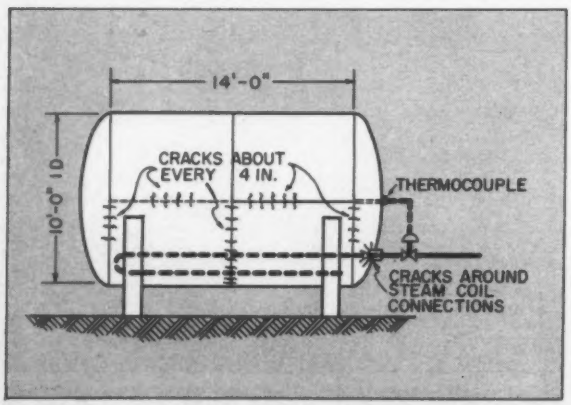



**Fig. 12. Failure of storage tank, handling 50 per cent sodium hydroxide, occurs at longitudinal and circumferential welds**

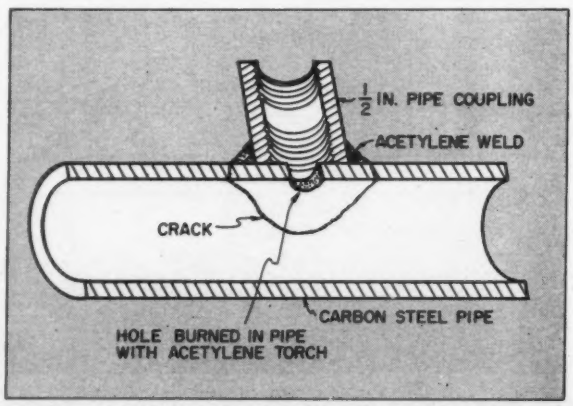



**Fig. 13. Stresses set up by burning and welding connection were responsible for stress-corrosion cracking in caustic line**

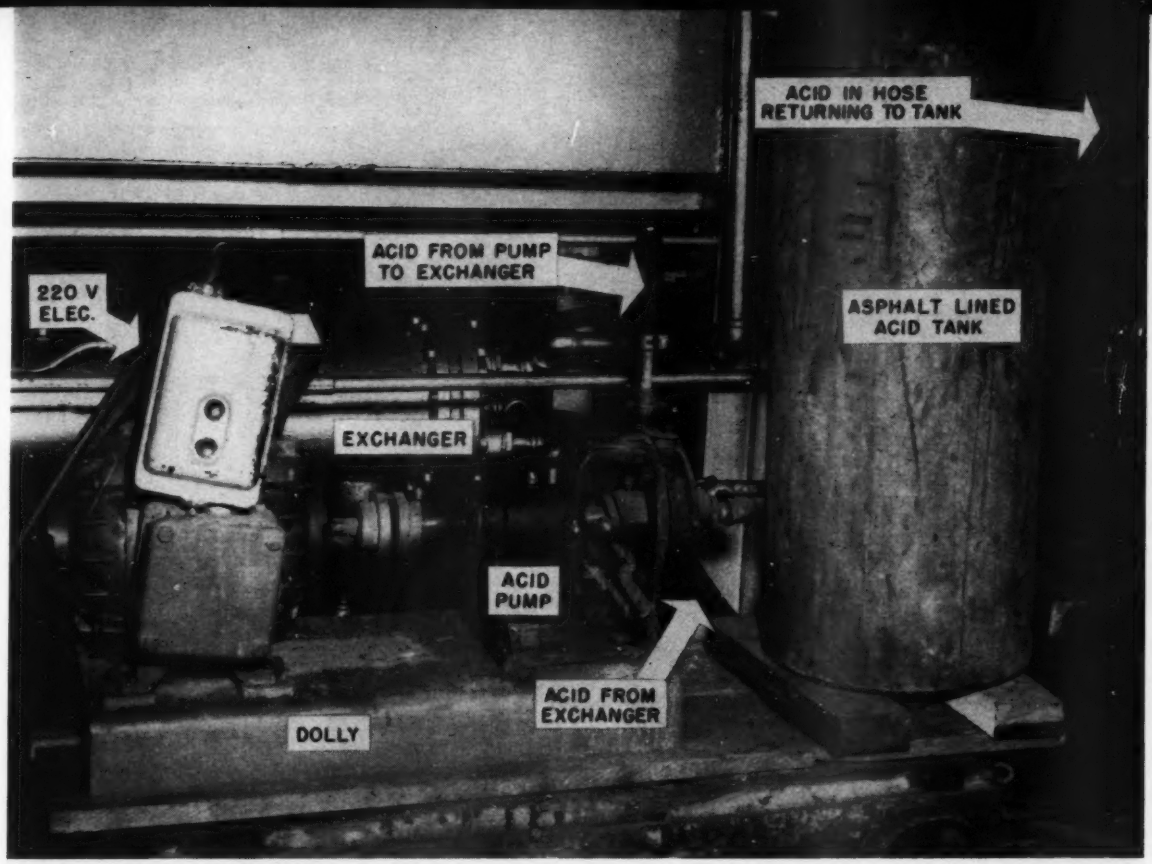



**Fig. 1. Acid, pumped through closed cycle consisting of acid tank, pump and heat exchanger, cleans scale from tubes**

# Cleaning Heat Exchangers Made Easy

## Water—Steam Flow Switch Does It for Lionel

**By WILLIAM H. NAGEL, Plant Engineer, The Lionel Corp., Irvington, N.J.**

WITH AN average employment of 2500 people, the Lionel Corporation of Irvington, New Jersey uses about 12,500 gallons of hot water daily for sanitary purposes. Because of space limitations, a 100 gal surge tank, in series with a 4200 gph steam operated heat exchanger, supplies the hot water. The remainder of the sanitary supply water is made up from the waste cooling water from other heat exchangers used in process work in the plant.

For years, water was passed through the coils of the heat exchangers while steam was passed over the outside. Since the company's own well water, with a hardness of 250 ppm total dissolved solids, is used untreated in the heat exchangers, a scale of calcium carbonates and magnesium salts would build up inside the tubes. This necessitated cleaning the tubes manually each month. Tubes were often damaged in the process and sometimes they were completely clogged so that they could not be cleaned. They would then have to be sealed off and the heat exchanger operated at a lower capacity. Eventually the exchanger would have to be retubed.

The remedy for this constant maintenance and high loss was to switch the flow of water and steam, so that the deposit-causing water is always on the outside of the tubes. Scale thus formed is easily accessible, making it possible for 11 of the 12 heat exchangers used in the plant to be now cleaned in place by pumping muriatic acid through the heat exchanger vessel.

The acid is pumped through a closed cycle formed by the pump, a tank of acid and the exchanger, see Fig. 1. Neoprene hose is used for connections. Pump and tank are wheeled on a shop dolly to each exchanger.

Although the heat exchanger tubes are made of copper, no acid inhibitor is necessary, since the carbonates in the scale neutralize the acid, thus reducing its attack on the tubes.

Acid is pumped through the exchanger until the gas-producing reaction ceases. Water, pumped through the exchanger, dilutes the remaining acid prior to another alkali rinse. This is followed by a thorough water rinse to prevent corrosion cleaning.

Only one heat exchanger, used to supply hot water to the plant, is dismantled for cleaning. The tube bundle is removed from the shell and immersed in a muriatic bath from four to six hours, depending on the amount of scale present. When all the scale has been removed, the tubes are neutralized with an alkali solution, followed by a water rinse.

By switching the steam and water flow, cleaning is necessary only twice a year, since the scale can be left to build up more than would otherwise be permissible. While this method is somewhat less efficient, coil life is considerably extended. There have been no tube replacements necessary during the past eight years.

Fig. 1. View of installation from scale end of platform. Weigh hopper in foreground dumps formula mix into skip hoist

# Bulk Handling by Formula

## System Weighs, Transports and Blends Abrasive Granules

By JOHN J. FISCHER, Chief Engineer, Chemical and Process Div., Patterson-Kelley Co., Inc.

ONE PLANT of the Carborundum Company's Refractories Division, located at Falconer, N.Y., recently solved a production problem by revamping their methods of weighing, blending and handling materials. Goals of the revision were: consistently accurate weighing and blending; lowered labor costs; increased production potential; reduced dusting; and higher refractory purity. The last is very important at Falconer because the glass industry requires the purest type of refractory to minimize chances of discoloration and defects in finished glass products.

Carborundum's problem centered in the first stage of production of fused-cast refractories, where the raw materials are weighed and mixed according to formula. A typical formula might include five or six different ingredients in varying amounts.

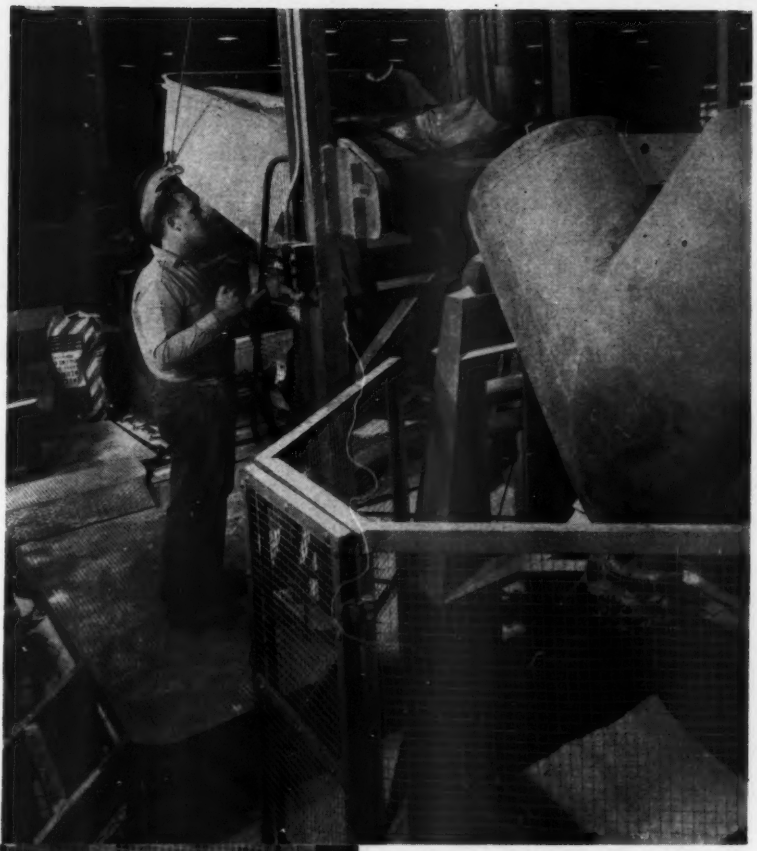
### Proportions Are Important

If at any time during the handling and mixing of these raw materials, the proportions are altered (due to leakage, improper weighing, mixing unlike batches, inadequate blending), then the finished refractory will differ in quality from that specified. It is also important that the relatively minute quantities of the formula—silica, calcia and soda—be evenly distributed throughout the mass of the material.

Carborundum had been using a rotary barrel mixer with internal vanes to blend their dry materials. Batches were weighed by hand and then loaded into the machine through a side-access port; discharge was effected through a port on the opposite side. Blending time was established on the basis of a sampling to assure that a complete blend had been made. When mixing batches of similar formula, it is necessary to blend completely, because any residue in the mixer will alter the proportions of the next batch poured in. Residue often proved troublesome, because material accumulated along the vanes and settled at the bottom. It was not practical to take the time necessary to clean out the mixer after each batch.

Leakage from the sliding seals in the mixer added to the problem. The characteristic motion of the barrel mixer kept the highly abrasive cullet

**Fig. 2. Operator holds lever that starts skip hoist moving to dump into blender**

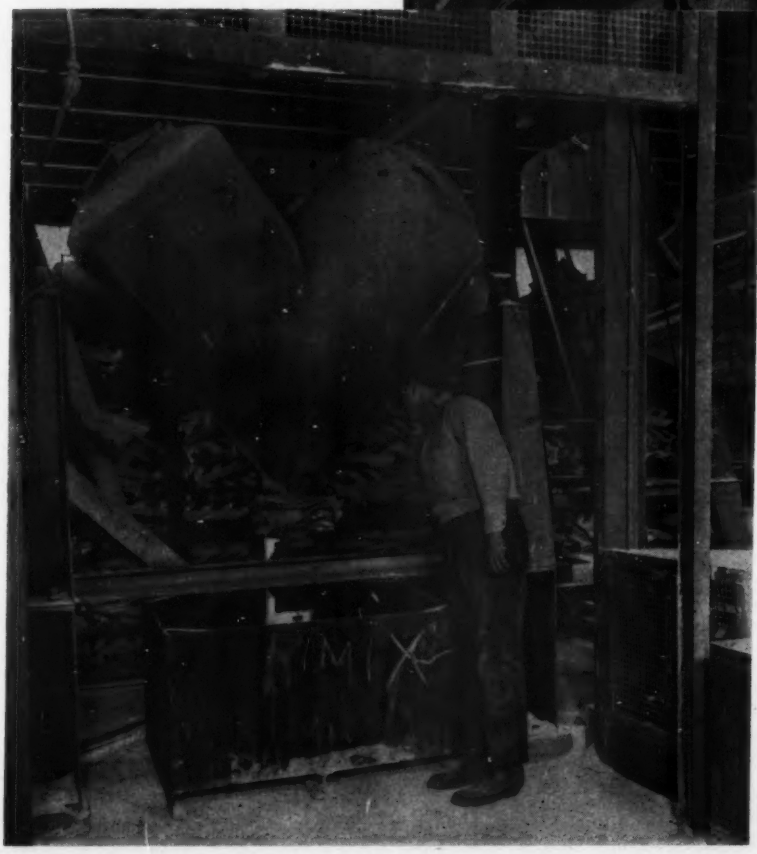


and scrap in contact with the seals continuously, and wear was excessive. Constant maintenance proved unsatisfactory, because the seals wore out too quickly to make maintenance economical.

Reviewing the existing method, Carborundum engineers recommended and implemented the following steps: 1. Install an accurate weighing system to measure exact quantities of raw materials. 2. End unnecessary handling of raw materials; make operations as continuous as possible. 3. Obtain a blender better suited for mixing abrasive materials.

On a site chosen to be the materials handling and mixing area, a steel platform 30 ft long, 10 ft wide and 30 in. high was built. At one side, a roller conveyer was installed on which skids of bagged bulk material could be stacked ready for immediate use, and at one end of the platform were two electric scales.

Close to the first scale, the proportionately small quantities of the formula were stored in bins, to be scooped into a container on the scale and weighed to within 1/10th of a pound. The other scale functions in conjunction with a weigh hopper; cullet and scrap are measured in from an overhanging chute, and then the bulk ingredient, alumina, is taken from the conveyer, unbagged into the weigh hopper and weighed to within 0.2 per cent of batch.



The weigh hopper is then tipped, emptying the batch into a specially-constructed skip hoist, in which it is elevated by cables to the access opening of a Patterson-Kelley twin shell blender installed at the opposite end of the platform. The material is poured into the blender and the access cover is closed. An automatically-timed 3½-minute blending cycle is set in motion by the operator, who is then free to prepare another batch in the weigh hopper.

After completion of the blending, the discharge valve at the bottom of the blender is opened, allowing the material to flow into a waiting bin. With no internal baffles or vanes in the blender to obstruct the flow of material at discharge, no residue is left to contaminate the next batch. The bin is then picked up by a fork truck and hauled away to the furnaces for melting and casting.

**Fig. 3. After mixing cycle, material is dumped into hopper, moved to furnace**

# Kaiser Designs Maintenance Out—

## Coordination of Electrical, Mechanical Design Cuts Downtime

By JOE ST. ANDRE, Chief Electrical Engineer, Kaiser Aluminum and Chemical Corp., Newark, O., Works

A GREAT DEAL of attention is being paid today to maintenance of electrical equipment. The tremendous swing to replacement of manpower by electrical horsepower with complex control systems that outperform the functions of seeing, feeling, hearing, smelling and even thinking in the human being have placed the productivity of most plants in the hands of the maintenance people. These new machines that cost so much and promise so much actually produce only when they are in operation. Downtime is becoming too expensive to be tolerated in any plant.

### Electrical Absenteeism

During World War II, all sorts of schemes were tried to cut down absenteeism of employees. Today there is another kind of absenteeism that is just as much a problem. Electrical absenteeism is more deadly than employee absenteeism for it may result in total plant shutdown and disrupt production schedules to the breaking point. Power outages, overload tripouts, motor burnouts and failure of any component in a control system are typical examples of this new kind of absenteeism which is bothering so many plants today.

Why is this problem getting more troublesome today, you may ask? Take a look at your power bill. Compare it with a bill, say three years ago. You will be in for a big surprise. The build-up in the use of electricity in every plant is usually so gradual that management is unaware of the transposition of electrical horsepower into the many tasks being performed throughout the plant. But your power bill will set you straight.

What has this got to do with production and the need for getting the most out of your electrical equipment? It follows that the more you use electrical equipment, the more important part it can play in the output of your plant. Keeping this electrical equipment in running order at all times is important and that is the function of your electrical maintenance department.

How successful your electrical department is in its endeavor to keep your equipment running depends on many factors. Perhaps the most important of these factors and one that is overlooked in most plants may very well be the key to a "Go and No-Go" electrical maintenance performance. This factor is the kind of equipment that you have in your plant, how it is being used, and the kind that you will be getting from the machine tool builders.

You hear a lot these days about preventive maintenance. Some call it productive maintenance. Others call it planned maintenance. Whatever you call it, all objectives lie in the same direction. Get rid of trouble before it can happen. It makes sense, most managements will agree. Well then, how about seeing that maintenance is built into the machine when it is bought in the first place? And for those machines that you already have, how about building maintenance into the operation of those machines? Let's look at the first problem, getting maintenance built into machines that are being bought.

Solution to this problem lies in the word "coordination." Very few electrical devices or equipment in themselves produce any goods. To be sure, there are plating processes, welding, electric furnaces, electronic systems, etc., but, 99 per cent of electrical equipment transfers electrical energy into some form of mechanical work. Therefore, is it too much to ask that the electrical designers know fully and interpret correctly, the mechanical functions that they are trying to produce by means of electric motors and control? "That's no problem," most of you are saying to yourself. But, are you *sure* it's no problem in your plant?

Machine tools are bought to do a certain job in the plant. When it is determined that a new tool is required, we at Kaiser Aluminum are fortunate. The plant engineering department is called into the picture at the beginning. We find out what production needs through meetings with the department heads. The loadings, (very important), the limitations, and most important, future requirements of the machine in question are discussed. I get into the picture early and assign an assistant to the project. We thus get an idea of what we are going to

### How To Increase Costs and Cut Production

**Any plant management that is interested in increasing its costs need look no further. Here, for the first time, condensed from the accompanying article, are a few guideposts that are guaranteed to lead any plant into the land of High Costs and No Profit.**

**1. Never let plant engineering know in advance what production is planning to do.**

**2. When purchasing machine tools or other equipment requiring special drives and/or close control just turn the order over to the maker with as little supervision as you can muster.**

**3. Make certain the equipment manufacturers patronized by your firm have engineers with little or no comprehension of the problems and language of the electrical engineers of their electrical suppliers.**

**4. You have to be lucky too. If you are able, as some have been, to get a-c motor drives when you need d-c—or vice versa—or if you can manage to get the wrong electrical controls, you have it made. This should, in itself, increase your operating costs to the breaking point.**

**You can, of course, take the easy way out and cut down on maintenance and replacement costs by having plant engineering's electrical department coordinate all the mechanical and electrical design. If you want to do it this way—then go ahead and read the article.**

## About the Author

**On land, sea and in the air, Joe St. Andre has practiced his profession of electrical engineering. He has been, at various times, a field engineer for General Electric Co., Chief Electrical Engineer for General Cable, Maintenance Superintendent for Wright Aeronautical, Sales Manager for Continental Electric Company and in the U. S. Merchant Marine for four years. He is now, and has been for more than a year, Chief Electrical Engineer in the Plant Engineering Department of Kaiser Aluminum and Chemical Corporation in Newark, Ohio.**

try and accomplish with this new tool and what we will need in the line of controls. Specifications are then prepared to accompany the mechanical requests to the tool manufacturer.

What happens when the above procedure is not followed? The request for a machine brings in machine tool salesmen to discuss the problem with production people. Of these salesmen 99.9 per cent have mechanical backgrounds. So have the people that they are talking to. Certain requirements are decided upon. The machine will turn out so many widgets an hour. Maintenance, no problem. Price and delivery? By return mail. And so a machine is born. The first time Plant Engineering knows about the equipment is a delivery date and a date for the equipment to be running.

### Who Designs What?

But let us follow that order more closely. Chances are that the machine tool builder has no electrical design department as such. So the machine builder calls in an electrical manufacturer to design the drive. If price is tight, several companies get into the act.

What kind of controls are required? How fine are adjustments? Do you provide additional capacity for future expansion? What types of motors does the customer need? In some cases, these questions are passed on to the customer but most of the time the details are worked out between the machine builder and the electrical supplier. This is the point where your maintenance costs are determined.

In the first place, it is doubtful that the two engineers understand each other. The machine builder knows what he wants to do mechanically. The electrical engineer knows what he can do electrically. The question is, are they both thinking alike? I doubt it. Much of the details are worked out over the telephone. The main objective is usually dwelt upon at some length but it is the little details that are brushed over and these little details may very well make or break the whole machine operation.

Electrical design engineers of the electrical suppliers are out in the left field of electronics. Kilocycles, rectifiers, blocking circuits, roll out into the conversation like mad. In self defense, some machine tool makers' mechanical engineers will agree to anything and away we go. Two things usually happen. Either the controls are too complicated for normal operation, too delicate to withstand the wear and tear of everyday use or they are too simple to accomplish the required tasks. In either case, the ultimate user pays the price in increased maintenance costs.

Another deal that may run up maintenance costs takes place when the question of the original cost of the machine gets into the picture. Most of the cost of the machine goes for the part of the equipment that the manufacturer knows the most about, namely the mechanical portion. In order to meet the price quoted, the electrical equipment is cut to the bone. In place of totally-enclosed motors which reduce maintenance to a minimum, open type motors find their way into the machine. Controls are reduced to a minimum. Where oil type pushbuttons are needed, ordinary pushbuttons are used. Light duty limit switches are used where heavy duty are needed.

But probably the biggest area where maintenance costs are introduced is in the field of the control itself. Take the case of equipment used in our plant. Tension control is an important part of our process. Some of our processes require accurate control of tension over a wide range. If the type of control is not designed into the machine when it is built, the machine will not be able to meet the ever-increasing requirements of quality control. Plant Engineering is faced with the task of redesigning the controls to provide this extended coverage. In some cases new controls have to be installed at costs of thousands of dollars.

Where does the money come from to do this work? Out of the plant operating budget, of course. Sometimes equipment just doesn't stand up to the work assigned to it. A friend of mine was telling of a situation in his plant where a-c motors on wire drawing equipment were trying to do the work of d-c motors. The result: a string of motor failures. The situation was solved by installing new drives, at a cost in the neighborhood of $100,000. Constant work must be done to come up with new designs on motors and controls to overcome bad application of original equipment. But this takes time and money, an expense which could have been avoided by proper electrical equipment.

Another problem that plagues electrical maintenance is operation of equipment under conditions for which it was not designed. It is understandable that a certain amount of experimentation sometimes has to be done to establish limitations of operations. But when these limitations are clearly established, exceeding these limitations will not only result in damage to equipment and costly repairs, but the problem of downtime rears its head.

### When Things Go Wrong

One of the big problems in our plant is inching equipment used to line up spools or inspection of work. Inching is no problem when proper provisions are built into the motors and controls. Ordinary equipment will not operate too long under these abnormal conditions, and the results in using ordinary equipment can be burned out motors and controls.

Speed up of equipment often results in overloading of equipment. Sometimes the trouble is not with the equipment being speeded up but with other equipment tied into the process. We found a 200 hp synchronous motor being stopped excessively on a rubber warm-up mill. The trouble was due to a change in the size of the batch being warmed up which could not be handled on the conveyor that took the material away from the mill. Continuous operation in this duty cycle would in time burn out the motor. We found it out by excessive maintenance on the controller contacts.

### Coordination Needed

The answer to the above problems lies in that magic word "coordination" referred to before. We in the electrical section of Plant Engineering are moving towards getting this coordination in our plant by working more closely with the mechanical engineers in the plant engineering department. We are getting to understand the problems of production. We are making sure that production understands the problems we face in getting them what they need. We are writing electrical specifications that will get us what we need to do the job. We are providing the liaison between the machine tool builder and the supplier of electrical equipment.

We hope to get the most out of our

electrical equipment by a clear cut understanding between the mechanical and electrical functions so that each understands what the other wants or needs to perform the required task. This can only be accomplished by:

1. Clear establishment of the work to be performed.

2. Correct application of the various electric components to perform the task.

3. The combination of both electrical and mechanical design with an understanding of the maintenance and operating problems which will arise with the equipment in operation.

In view of the fact that there are usually three different groups involved in accomplishing the above aims—namely production, outside suppliers and Plant Engineering—getting the right application especially from the maintenance angle calls for very close cooperation of all parties involved. We consult with the maintenance department and call upon their experience for help in arriving at a decision as to what equipment to buy. When the equipment finally arrives, the maintenance department has to install it and put it in operation. Lack of proper instructions or any idea of what the equipment has been designed to do will ruin the best equipment that can be bought.

Servicemen and demonstrators who assist in setting up and operating the equipment are, for the most part, mechanical personnel who know very little about the electrical functions outside of pushing buttons and adjusting controls. In order to get pieces of equipment started off in production under the best of conditions, our electrical engineers test the equipment and write operating instructions when turning over the equipment to production. On some machines, we even instruct the operators.

To get the most out of our electrical equipment, we start at the beginning and make sure that the electrical equipment is fully capable of doing the tasks assigned to it. It is nice to talk about "pushbutton" factories and "automation" but a pushbutton plant rapidly becomes a liability when the devices to which the pushbuttons are attached fail to do the work assigned. Determination of how much you can get out of electrical equipment starts way back on the drawing boards.

We recognize that a great deal of misunderstanding, however, can be attributed to the electrical engineers in failing to outline the limitations of electrical equipment in terms which the mechanical engineers can understand and put to use. Understanding comes from the use of a universal language. Unfortunately in most cases, the "electrical language" is foreign to the rest of the interested parties. The ultimate result is seen in not getting the most out of the electrical equipment in our plants today.

**One example of equipment used in the author's plant is this Quantometer which analyzes metals for chemical content**

**Plant engineers from all parts of the United States and Canada attended last year's All-Engineers' Luncheon which was held at Convention Hall in Philadelphia. This year's luncheon will be held in Cleveland, Tuesday, January 29th**

# All-Engineers' Luncheon

## On Second Day of Plant Maintenance and Engineering Conference

PLANT ENGINEERS from all over the country will have an opportunity to say "hello" to each other at the fourth annual All-Engineers' Luncheon of the American Institute of Plant Engineers. The luncheon will be held on Tuesday, January 29, 1957, at 12 noon, in the Cleveland Hotel, Cleveland, Ohio.

This will be on the second day of the annual Plant Maintenance and Engineering Show and Conference. Plant engineers who plan to attend the conference and would like to include the luncheon on their schedule, should fill in the coupon appearing on this page and mail it to the address indicated on the coupon.

The guest speaker at this luncheon will be Dr. Alfred J. Cardall. He will open up many challenging possibilities for plant engineers with his talk on the fundamentals of handling people effectively.

Dr. Cardall is well known as an industrial psychologist and management consultant through his many lectures and articles on the technical phases of selective training, executive development, systems and procedures work.

He received his bachelor's and master's degrees from Boston University. After 15 years in industry, specializing in personnel and systems work, he went back to school, receiving his doctor's degree in psychology from Harvard University.

Following the war years he became a director of industrial relations for a nationally known organization and subsequently returned to consulting work as head of his own organization —Cardall Associates.

To Dr. Cardall, able management of a plant engineer's department is a psychological as well as a cost problem. He combines his interests in the selection and training of managers and supervisors with cost reduction and work simplification.

The price for the luncheon is $5.00 per person. When making your reservation, send your check or money order—do not send cash—for the number of luncheon tickets you require. Tickets will not be mailed for reservations received after January 18, but will be held in the purchaser's name and can be picked up at the door on the day of the luncheon.

This is the one time every year when plant engineers have a chance to compare notes and see what the other fellow is doing, so get your tickets early to be sure of a reservation.

**American Institute of Plant Engineers**
**P. O. Box 9304**
**Pittsburgh 25, Pa.**

**Kindly send me ..... tickets for the All-Engineers' Luncheon of the American Institute of Plant Engineers to be held at the Cleveland Hotel, Cleveland, Ohio, at 12 noon, on Tuesday, January 29, 1957. Price: $5.00 per person.**

**☐ Check ☐ Money Order is enclosed for the reservations indicated above. (Make check or money order payable to the American Institute of Plant Engineers.)**

..... Name

..... Company Address

..... Company

..... City — State

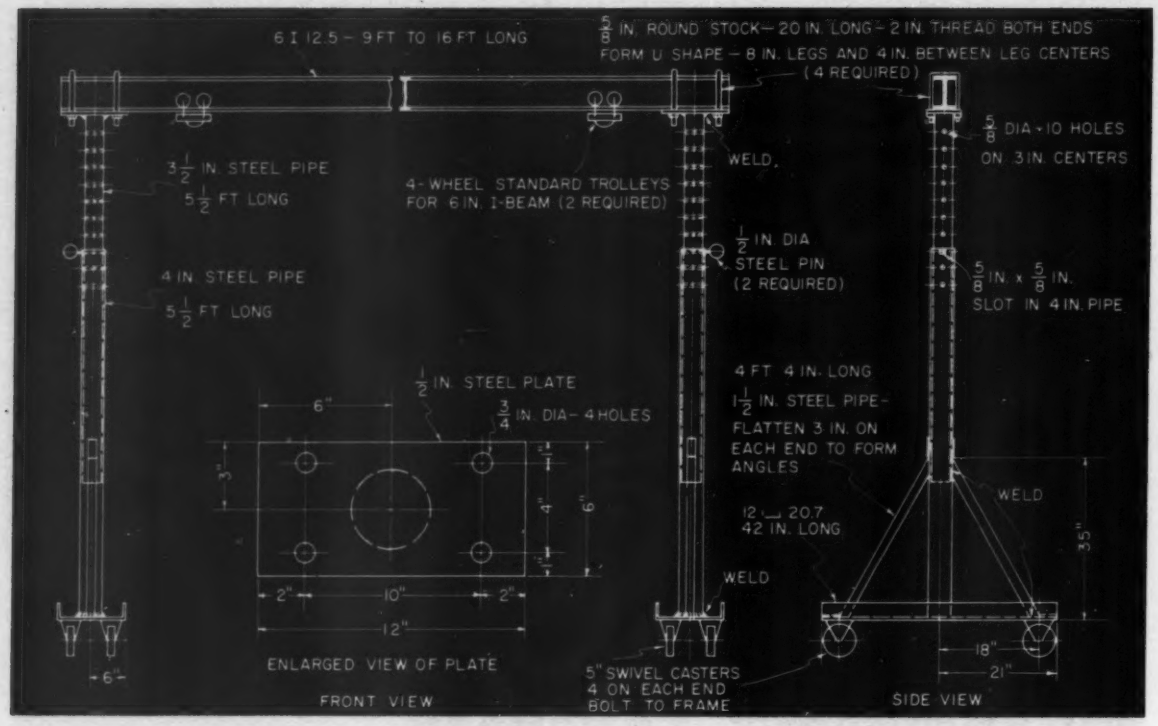



**Fig. 1. Sketch shows hoist frame which was made in the plant's maintenance shop. It cost approximately $200.00 in labor and material to build, and it has saved the company this amount many times in handling the heavy moving jobs**

# Hoist Frame — Backbone for Handling T

**By JAMES G. ARMSTEAD, Maintenance Engineer, F. C. Huyck & Sons, Rensselaer, N. Y.**

**Fig. 2. One place where this unit is put to good use is in lifting these huge vats. The unit is equipped with casters, permitting movement of heavy equipment to another location**

**Fig. 3. The hoist frame is adjustable in both height and width and is equipped with chain hoists suspended from trolleys that move on an I beam. The frame is quite maneuverable in close quarters**

# This Plant's Heavy Lifting Jobs

SOME YEARS AGO, we had what was colloquially referred to as an A frame. This device consisted of two wooden frames arranged as a letter A separated some feet apart by a beam fastened at the top of the two end frames. Block and tackle, or hoists, could be supported from this beam and used to raise pieces of machinery from the floor in order that rollers or trucks could be placed under them.

In 1947, one of our engineers worked out a steel structure to replace this now outmoded wooden device. As can be seen in the photographs and sketch, it is built from material that most plants would have either in their stores supply or as scrap material. We used a 12-in. channel, inverted, as a base for the two ends, to which we welded a piece of 4-in. pipe to make a post. An equal length of 3½-in. pipe inserted in the first one makes an extensible post to permit working at different elevations.

Three pieces of 6-in. standard I beam were attached to these posts with clamps. As a result, we have a frame which is adjustable in both height and width so that we can arrange it to straddle most any piece of equipment we need to move. Chain hoists are suspended from trolleys that move on the I beam. Having picked up the equipment, we can roll it and the hoist supporting it on the casters provided under the base.

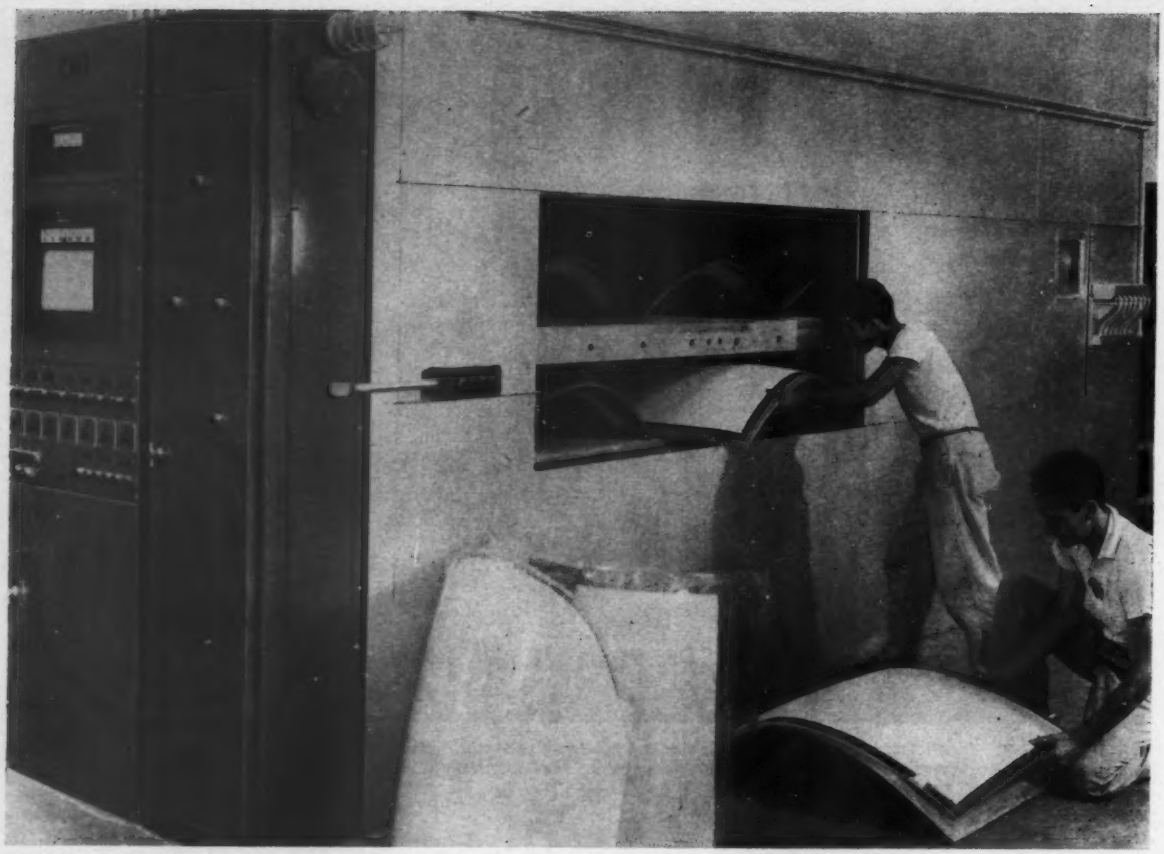
We have found this device extremely helpful in moving machinery where aisle space between machines does not permit the use of power trucks. Without it we would have had to fasten our block and tackle or chain hoists to eye bolts hung from the ceiling. Because the base parts are relatively narrow it is quite maneuverable in close quarters. It cost us approximately $200.00 in labor and materials to build, and it has saved us this amount many times over in the intervening years.

Power trucks augment manpower in pulling this frame from its storage point to whatever part of the mill it is needed. We also use a lift truck to raise the upper portion to get the proper elevation and to raise the hoist for hooking to the trolleys.

The supervisors of the various maintenance crafts each have a table which indicates the maximum load that they may suspend from this beam for each length from a minimum of 3 ft between supports to a maximum of 16 ft, which is the longest I beam used with this frame. The computations were based on a concentrated load at the center, so that any other arrangements they might use for suspending a load would always be on the safe side.

**Loading table is based on 6-in. standard I beam with the load concentrated at the center, and laterally unsupported**

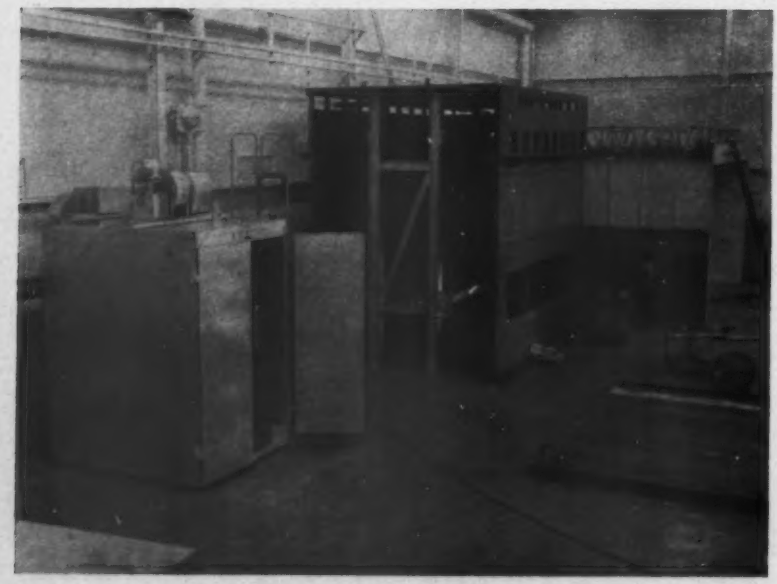
| Span (ft) | Safe Load (lb) | Span (ft) | Safe Load (lb) |
|---|---|---|---|
| 3 | 16,000 | 10 | 4,850 |
| 4 | 12,000 | 11 | 3,980 |
| 5 | 9,750 | 12 | 3,360 |
| 6 | 8,100 | 13 | 2,790 |
| 7 | 6,950 | 14 | 2,460 |
| 8 | 6,100 | 15 | 2,160 |
| 9 | 5,400 | 16 | 1,890 |



Workmen loading acrylic plastic airplane canopy components into annealing oven. Double sliding doors minimize heat loss

# Plant-Designed Plastics Oven

## Minimum Floor Space Just One Feature of Ferris Wheel



View at rear center of the oven. Note height compared to floor area covered

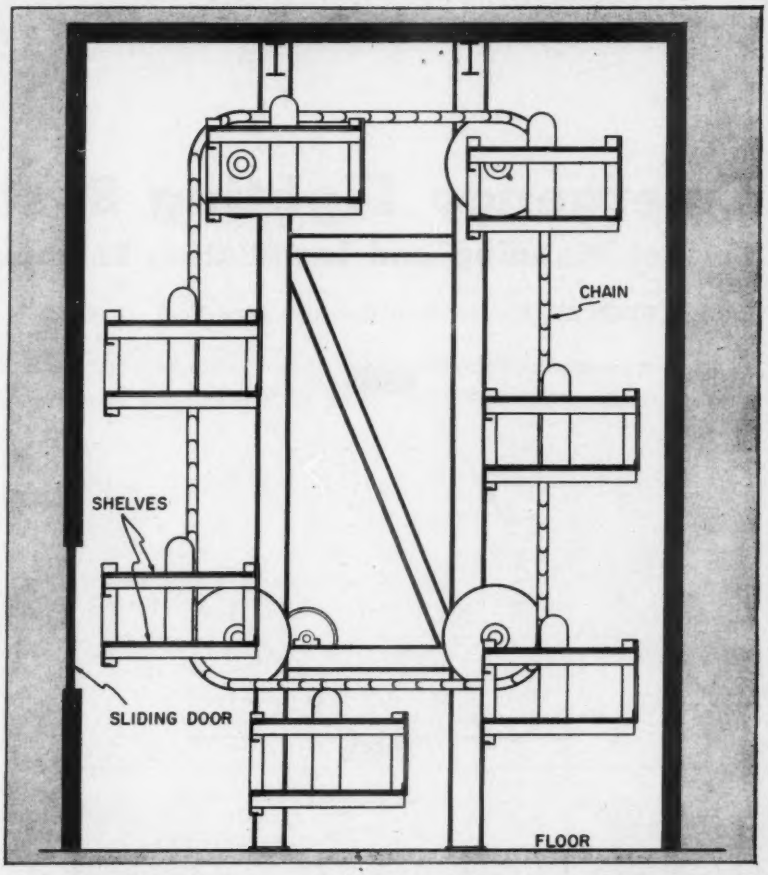
A NEW "ferris wheel type" oven for annealing acrylic plastics aircraft parts is featured in the new plastics parts production building completed recently at the Torrance, California plant of Douglas Aircraft Company. The oven is 16 ft long, 10 ft deep, and 18 ft tall. Its operation is patterned after that of an amusement park ferris wheel.

These are seven double parts platforms within the oven, each mounted like a ferris wheel seat between sprocket chains at each end of the oven. In use, the platforms are loaded or unloaded one at a time as they appear before the twin sliding doors that provide oven access at worktable level. After the platform is loaded, and starts its "ferris wheel ride" through the oven, it is not available again until it has made a complete circuit and reappears at the sliding doors.

The speed at which the sprocket-drive carries the platforms is adjust-

able, and is set so that a single complete revolution of a platform around the "ferris wheel circuit" is accomplished in the exact annealing time required for the parts it contains. Thus once an acrylic part is placed into the oven, it is normally impossible to remove it until it has been fully annealed.

Advantages claimed for this new-type oven are: 1. a minimum of floor area is required (due to oven height) for the number of parts it can anneal at one time; 2. ease of loading and unloading; 3. minimum oven heat losses while the access doors are open for loading; 4. automatic control of temperature and annealing time; and 5. the fact that parts cannot normally be removed from the oven until they have received a complete anneal.



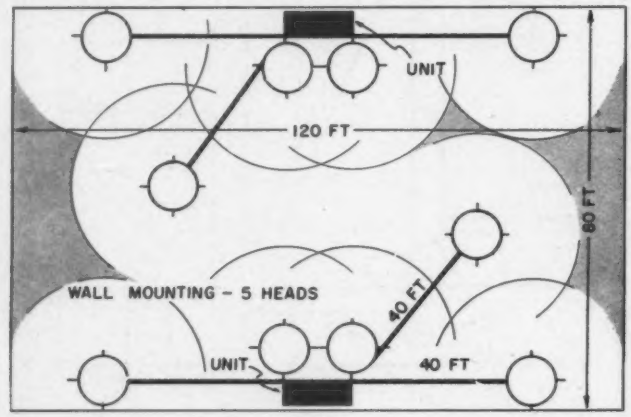

**Schematic end view of the oven. Sprocket chain drive shown at this side of oven is duplicated on the other side with swinging platforms suspended between chains**

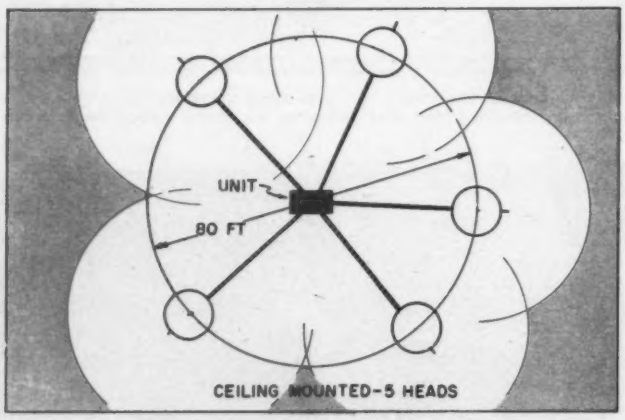
**This view inside the ferris wheel oven shows three of the double, free-swinging platforms attached to sprocket chains**

# Emergency Lighting Systems . . .

## Correct Planning and Installation Is Important

By C. J. BRIEFER, Electric Cord Company, New York, N. Y.



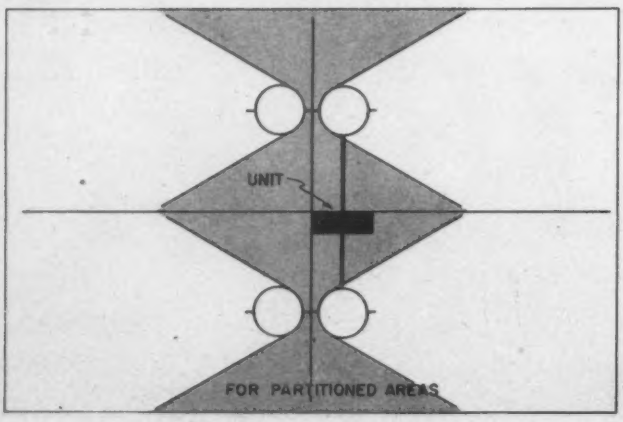




Fig. 1, 2, 3. Suggested layouts using multiple lighting heads

AMONG THE primary functions of the plant engineering staff is the achievement of safety in plant operations. Emergency lighting has found new importance in the safety program, due to the growing realization that no plant is truly safe for personnel or for the plant's physical assets, unless it is protected, by dependable standby lighting apparatus, against sudden blackout caused by power failure.

Industrial plants are buying and installing this specialized lighting equipment, but some are experiencing excessive maintenance costs.

In one instance, a large plant installed 40 emergency units that had been manufactured to operate on a current of 110-120 volts. They were, however, connected to a 127-volt circuit. Since their installation, a maintenance man has been adding water every week at a cost of $60.00 per week. This frequent addition of water shows definitely that the batteries are being overcharged; they will offer little or no protection in the event of a power failure.

There are many factors that a plant engineer must consider if he is to get an efficient installation. Such an installation should assure him that: 1. The emergency lights will go on instantly, automatically in the event of a power failure. Similarly, they will shut off instantly and automatically when power is restored; 2. During power outage, he will get sufficient light for an adequate length of time to assure safe exit of personnel, operation of the telephone switchboard, location of fire fighting apparatus, and temporary continuation of operations until restoration of power; 3. The system will be properly engineered to give efficient operation and will have the smallest number of units needed to do the job; 4. The electric system is completely automatic to keep maintenance costs at a minimum.

A most important consideration for selecting a system is the type of chargers to be used. Manually operated

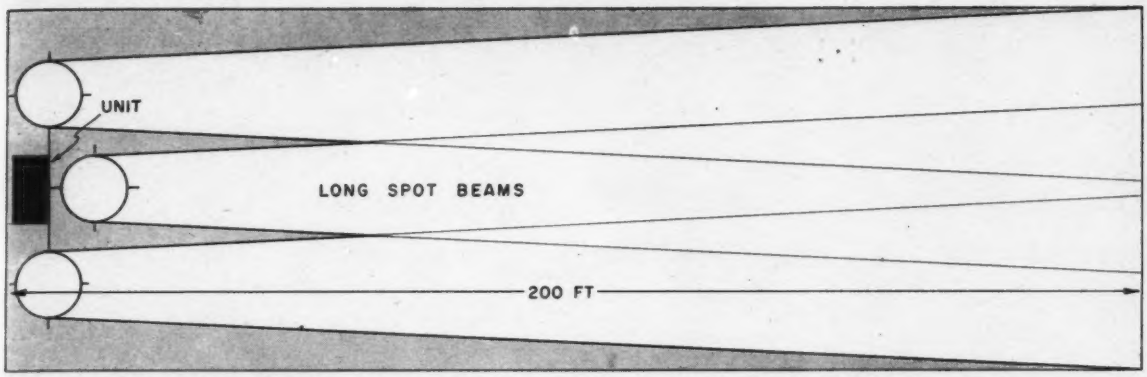



**Fig. 4. With sealed beam spotlight heads, emergency lighting units can be set up to flood long corridors or aisles**

timers, trickle chargers and high rate chargers require attention, involving the element of error that is always present where humans are concerned.

The battery to be used merits careful consideration. Since the National Electric Code does not accept rubber case or automotive type batteries, they should be of the glass jar type with floating hydrometer balls that are visible from a reasonable distance. They should have sufficient amperage to allow for successive power failures and for the ultimate deterioration that must take place.

A unit equipped with the right kind of battery and electrical components will give a minimum of five years' service; both units and battery should be guaranteed for this length of time.

Given equipment that possesses all the desirable characteristics already mentioned, the next step is the planning of the installation. A thoroughly engineered installation is important.

A well-planned system will take into consideration the savings that can be effected by using remotely mounted heads, operated from one power source.

The electrical capacity of the battery and electrical components, the gage of the cables, the number of heads that can be safely used with one unit and at what distance are other factors that must be planned. With the emergency system operating on low voltage, a plant engineer engaged in an installation must alter his thinking from his usual dealings with high voltages. This involves the gage of cables used to carry the current.

For example, a six-volt current passing through a 12-ga. cable with a load of 20 amps suffers a voltage drop to 4.24 volts at 25 ft. However, using a 6-ga. cable, the same load can be carried 40 ft without voltage loss. Table 1 shows the proper cable sizes for low voltage extensions.

System layouts will of course vary with the layout of the area or areas to be lighted. Figures 1, 2, 3, 4 and 5 illustrate several such layouts, with multiple lamps operating from a single control unit. Each area presents its individual problems and should receive individual planning. Long aisles or corridors require special treatment—long beam heads may be used to illuminate 200-ft lengths.

**Recommended cable gages for extension wiring in emergency lighting systems**

**RECOMMENDED CABLE GAGE FOR LOW VOLTAGE EXTENSIONS**

For Various Cable Lengths Carrying Loads of 3 to 25 Amps at 6 Volts
(For 12 volt system, cable length may be doubled)

| Load in Amperes | To 10 ft Use | To 20 ft Use | To 30 ft Use | To 40 ft Use |
|---|---|---|---|---|
| 3 | 18 Ga. | 16 Ga. | 14 Ga. | 12 Ga. |
| 6 | 16 | 14 | 12 | 10 |
| 15 | 14 | 12 | 10 | 8 |
| 20 | 12 | 10 | 8 | 6 |
| 25 | 10 | 8 | 6 | 4 |

**VOLTAGE DROP**

| Cable Gage | Cable Load | Voltage at 25 ft | Voltage at 50 ft |
|---|---|---|---|
| 18 | 3 | 5.02 | 4.03 |
| 16 | 6 | 4.62 | 3.23 |
| 14 | 15 | 3.82 | 1.65 |
| 12 | 20 | 4.24 | 2.48 |
| 10 | 25 | 4.59 | 3.17 |

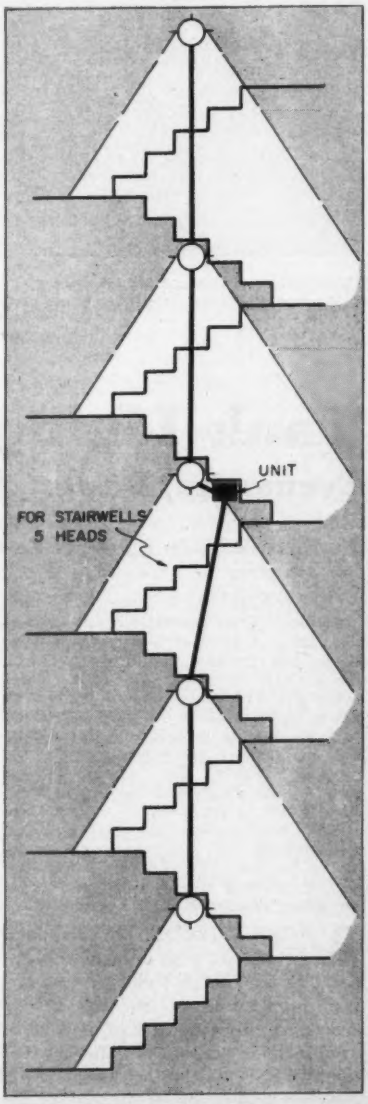



**Fig. 5. Typical stairwell installation**

**Installation of natural sheet rubber lining for use in electroplating tank. Rubber linings can be used for most inorganic acids except strong oxidizing acids such as nitric, chromic and concentrated sulfuric. Sheet linings are expensive, but good**

# Tank Linings—Thin, Thick, or Sheet?

## Economics, Design, Selection, Maintenance Factors

By **KENNETH G. LE FEVRE**, Vice President, Protective Coatings Div., Metalweld, Inc.

*CORROSION IS a destroyer of plant equipment; it is responsible for tremendous loss of product, for contamination of product, for interruption of processes, for needless equipment downtime. Tanks containing processing liquids are particularly vulnerable to attack. Therefore, tank linings, their selection, installation and maintenance are of prime importance to plant engineers. Mr. LeFevre, the author of this article, has done a comprehensive job in covering all the ramifications of tank linings from preparation of the metal through preventive maintenance and inspection. We feel this material is an exceedingly worthwhile addition to any plant engineer's file—The Editors.*

BEFORE DISCUSSING the various types of tank linings, it is imperative to point out that proper surface preparation is essential to the success of any type of coating applied to a metal surface, from the conventional paint job to the most closely specified tank lining. If the surface has not been thoroughly cleaned, and a paint or lining is applied over foreign matter, failure will occur due to loss of adhesion, osmotic blistering, or under-film corrosion.

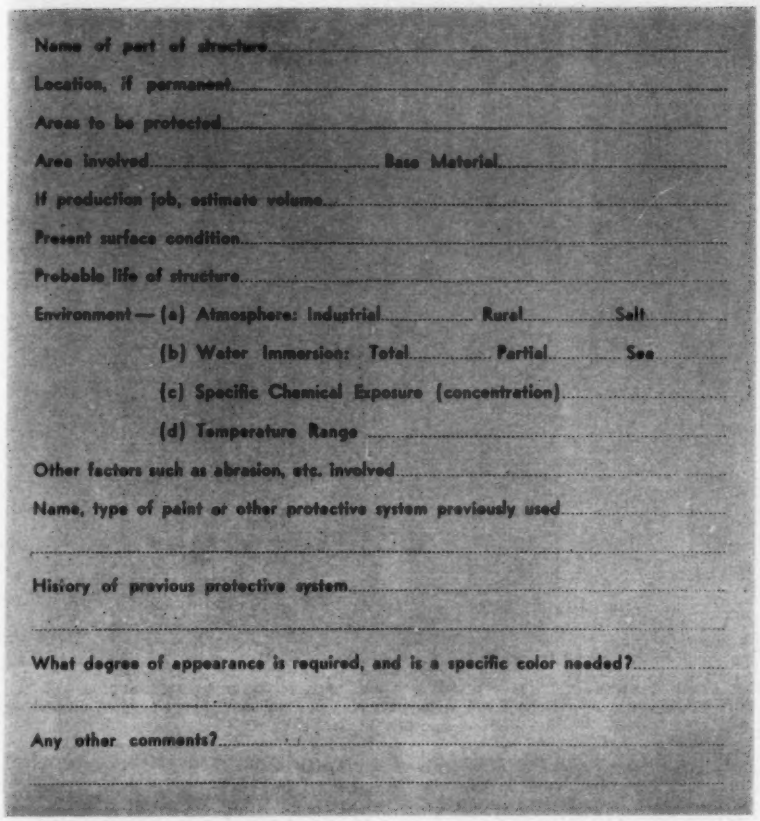
**Adhesion Loss**—When foreign matter is left on a metallic surface, it prevents the coating from direct contact with the base metal, causing poor adhesion, and coating or lining failure. The most common types of contaminating materials left on surfaces are: mill scale, rust, old paint, dirt, grease, oil and chemical deposits.

**Osmotic Blistering**—If soluble salts or other chemical soluble in water remain on a surface when the coating is applied, they are likely to cause blistering. The presence of these salts or chemicals aggravates the blistering condition through osmosis as a result of fluids passing from a dilute solution to a more concentrated solution.

**Under-Film Corrosion**—Chemicals remaining on a surface usually accelerate the corrosion of the steel, causing the coating to fail. This failure is best explained through the electrochemical theory of corrosion.

**Methods Used**—Any deviation from thorough surface preparation will result in premature coating or lining failure, leading to increased maintenance and equipment costs. Sand or grit blast cleaning, to white metal, is the only suitable method where a tank lining is involved. In addition to thoroughly cleaning the surface, blasting also produces a roughened keyed surface, which greatly increases the bond of the coatings or linings.

**Fundamental Considerations**—Before discussing any one of these in particular it might be well to look into the fundamental considerations necessary to the successful solution of any lining problem. First, the user must



Name of part of structure.....

Location, if permanent.....

Areas to be protected.....

Area involved..... Base Material.....

If production job, estimate volume.....

Present surface condition.....

Probable life of structure.....

Environment — (a) Atmosphere: Industrial..... Rural..... Salt.....

(b) Water Immersion: Total..... Partial..... Sea.....

(c) Specific Chemical Exposure (concentration).....

(d) Temperature Range .....

Other factors such as abrasion, etc. involved.....

Name, type of paint or other protective system previously used.....

.....

History of previous protective system.....

.....

What degree of appearance is required, and is a specific color needed?.....

.....

Any other comments?.....

.....

**This is the form used by the author's company to obtain complete physical and historical data regarding equipment to be coated for corrosion resistance**

ask himself whether his primary goal is: 1. Protection of the base material from corrosion. 2. Protection of the product from contamination; or 3. A combination of the two.

Next, a complete knowledge of the economic factors involved is necessary. For instance:

1. General considerations of initial cost, yearly service-life cost, cost of down-time in cases of lining failure and replacement costs.

2. Possibility that other base construction material might have of itself a sufficiently low corrosion rate as to be economically feasible.

3. At known corrosion rates, the life of an unprotected tank.

4. Practicability of in-place repair of a lining that has suffered mechanical damage.

5. Various safety factors—especially the danger of "breaks" in improperly protected tanks containing acids.

In order to gain a complete insight into the problems of selecting a lining, an analysis of the particular conditions of corrosion in relation to chemical exposure, the type of tank or other equipment to be protected, and similar information must be known. The form our company uses for this purpose is shown above.

In this connection, it is often very important to find out what specific chemicals have been in contact with the base metal during former service. The conditions of the surface in respect to the type of pits, as well as their extent and depth is important from the standpoint of proper surface preparation. If coatings have been used previously, this information should be presented so that there is a complete knowledge of the history of the vessel. Historical data along these lines, of course, are often the best indications as to the selection of future linings.

In general, there are three classes of protective materials available for immersion today: thin linings, thick linings and sheet linings.

## Thin Linings

**Synthetic Resins** — Such coatings as vinyls, phenolics, epoxy, liquid neoprene and others fall into this classification. They are applied by brushing, dipping or spraying the surface of a base material in a finished film thickness of 6 to 15 mils.

As far as immersion service is concerned it is extremely difficult to insure a pinhole-free surface or even to adequately test for one. Therefore, these coatings find greatest employment in contamination protection or mildly corrosive immersion service.

For actual corrosives they have proved adequate only on surfaces exposed to spillage, splash, spray and fumes.

Some common services for the synthetic resin linings are: water white solvents, food products such as liquid sugar, beer and whiskey, water, salt solutions, and fatty acids.

**Sprayed Metal Coatings**—In order to understand the use of sprayed metal coatings for corrosion-contamination protection, it is necessary first to mention the electrolytic effect. When two dissimilar metals are immersed in an electrolytic solution, one metal will suffer degradation in preference to the other according to their relative positions in the electromotive series.

This is essentially the property we take advantage of in metallizing a surface for neutral pH corrosion protection. If we metallize a steel tank with zinc or aluminum, the zinc or aluminum suffers degradation in preference to the base steel, protecting the steel from corrosion. We call this a sacrificial type of coating.

However, metallizing is by nature extremely porous, making it most unsatisfactory for actual corrosives.

Some common services for the sprayed metal linings are: water white solvents, glycerine, lacquers, oils, gasoline, water, degreasing chambers and other natural pH solutions.

**Combination Coatings**—These are among the most recent and promising of the new lining systems. Consisting of a sprayed metal undercoat sealed with an organic coating, such a system offers advantages of both types of material in one protective lining. In addition, the metallized surface, porous in nature, significantly increases the adhesion of the coating film because the coating soaks into the pores of the sprayed metal.

But most important of all, in case of a break or pinhole in the organic film, the metallized underfilm continues to protect the base metal, thus reducing the possibility of underfilm corrosion which is the major source of coating failures.

A sprayed metal base will also permit higher temperatures in contact with the organic coating due to the fact that the bond strength of organic coating to base metal is increased. Unlike the organic coatings, the bond of sprayed metal to the base metal is unaffected by increases in temperature.

Of course, the main thing to keep in mind in specifying a combination coating is to choose a sprayed metal that will not react with the solution which it is to contain. This seems too basic

**Blast cleaning of equipment to be coated or lined is necessary in order to assure complete removal of contaminants**

**This is pickling tank soon to be put into service. It has been lined with polyvinyl chloride, sheathed with acid-brick**

even to mention but costly mistakes have been made in the past through ignoring it.

The main advantages of combination coats are as follows:

1. Increased protection against corrosion.

2. Increased life expectancy of the lining by reason of the double protection.

3. Better resistance to mechanical damage. (Abrasion of the organic coating would still leave the protection of the impregnated sprayed metal.)

4. Higher temperature resistance.

5. Ability to take advantage of a particular material of construction without the expense. For instance, stainless steel or nickel metallizing in place of an all stainless steel or nickel tank.

While the list of advantages is lengthy, the following important limitations have retarded the adoption of combination coatings for severe corrosion service:

1. Unsatisfactory testing procedures. With present methods, it is impossible to test adequately for pinholes. For reasons to be explained later, it would be necessary to limit testing procedures to low voltages.

2. Costs of combination coatings are still somewhat high, particularly those which might prove satisfactory for severe service. By this we mean that the cost approaches that of sheet linings without all of the proved benefits of the latter.

While they are not recommended at this time for actual corrosives, combination coatings *do* have their place. Indeed, they are one of the most promising developments to come along in some time and they will stand up in certain services where nothing else will. For instance, combination coatings are beginning to be used in areas which, up to now, were the exclusive province of glass-lined vessels. For example, sprayed nickel sealed with a phenolic has been used for boiling hydrochloric acid contaminated with a solvent.

## Thick Linings

Such materials as bitumens and plastisols fall into the classification of thick linings. They are those materials applied by brush and spray techniques, by troweling or by dipping. Thickness of coatings in this group is greater than 15 mils.

**Bitumens**—Bitumens may generally be divided into those derived primarily from a coal-tar base or those derived from an asphaltic base.

Both types are widely used in immersion service though they suffer from two fundamental disadvantages:

1. High vapor transmission which permits eventual passage of the solution through the lining.

2. Little resistance to underfilm corrosion. This reason coupled with reason Number 1 can be disastrous.

**Plastisols**—Very recently, a great deal of interest has been shown in plastisol compounds. Up to now, plastisols have been used only for dipping racks and similar jobs in pickling and plating lines. However, they are fast reaching the point where they may be feasible for use as tank linings.

Available in liquids or pastes of varying viscosities, plastisols are dispersions of finely powdered vinyl resins and plasticizers. They form dense, flexible and tough plastic films when baked.

Coatings can be applied by dip, spray, roller coat, knife coat or even with a trowel in thicknesses up to 90-100 mils. When properly cured, these materials can often combine the features of a chemically inert plastic as well as the advantages of sheet rubber.

Unlike many other organic coatings, the heavy film thicknesses possible with plastisols can insure against porosity while at the same time providing a resilient film with good abrasion and impact resistance.

Plastisols have one rather serious limitation, however. They must be carefully cured within rather strict temperature limits, without localized "hot spots." This necessitates a standard oven cure. Thus, smaller tanks present no problem but for the larger tanks or tank cars frequently encountered, there simply are no ovens large enough for curing purposes.

Sheet linings may be defined as those materials which are applied by use of suitable adhesives in calendered or case sheet form. Thickness of ma-

terial applied is usually over 60 mils but there is no restriction on total thickness, other than economic.

## Sheet Linings

Sheet linings have had a good, reliable history in corrosion service for many years. All types of natural rubber, neoprene, polyvinyl chloride, lead, tin, polymethyl methacrylate and polyesters have been used in sheet form for tank lining work or as a material of construction.

It might be well to pause right here and explain that in our experience, sheet linings have unquestionably proved to be the most satisfactory materials for severe immersion service such as the lining of tanks in pickling and plating installations.

To understand this we must look into the question of pinholing or porosity which has been mentioned earlier in this paper but held for explanation until now.

**Porosity**—Because of the inherent problems of application when coatings are sprayed, brushed, or dipped whether in liquid or semi-solid form, it is always well to assume that these coatings will be porous to a certain extent.

Multiple coats of organic linings have a tendency to reduce the porosity in a number of instances and the probability of pinholes occurring over one another in succeeding coats is geometrically reduced as the number of coats increases. However, in many cases, it takes only one pinhole to cause failure, and once failure of the lining occurs, failure of the vessel, because of corrosion, follows closely behind it.

In the case of thin linings, even though they may be tested with low voltage spark testers to guard against the chance of porosity prior to placing the vessel in service, there are possibilities that only one or two coats out of the total six to ten are protecting the surface.

Most organic coatings have a high dielectric strength and, therefore, so long as there is one coat between the spark testing probe and base metal, no spark will pass, thereby indicating that the coating is pinhole free.

This does not preclude the possibility that through changes during polymerization of the coating, aging, and the physical action of the use of the vessel, this one or two-coat protection will not give the expected service life.

There appears to exist a good probability that even though a thin coating tests pinhole free, there will be a pinhole at some unknown point of weakness within a relatively short time. Therefore, the use of thin linings of an organic resin base and thickness of up to 15 mils offers risks when porous-free results are desired.

### When Specifying New Tanks That Are To Be Lined

1. Specify butt-welded vessels in preference to lap-welded or riveted vessels.
2. Specify flanged and dished heads in preference to flat heads.
3. Specify oversize and flanged outlets.
4. Specify self-supporting cone or elliptical roof on storage vessels.
5. Where internal columns must be used, specify a minimum number and that they be tubular.
6. Specify that all construction involving pockets or crevices should be avoided.
7. Specify that stiffener members be external to the vessel.
8. Specify that all weld spatter and all weld flux be removed.
9. Specify that all welds be ground suitable for the anticipated lining.
10. Specify that all welds be free of undercutting, cracking and pinholing.
11. Avoid interior use of rolled structural members, such as angles, channels, etc., in a back-to-back position or lying flat against the vessel.
12. Avoid use of any arrangement whereby the chemical is pocketed and cannot drain.

In the case of the application of sprayed metal linings porosity is inherent and cannot be eliminated. During the application, the metal wire is liquefied and then atomized and sprayed on the base metal. During the atomization process the small particles of the metal coating are in plastic state, and, as a result, their physical structure does not lend itself to complete flow-out.

It might be imagined that a coating resembles a number of fish scales held together by oxide cementation, welding one fish scale to another at the interface of each, and as a result the void between each one of these particles contains porosity.

It might be well to mention at this point, that where a non-corrosive is being handled and a lining is applied merely to prevent contamination or discoloration, the porosity inherent in these linings is not of major importance. However, porosity cannot be tolerated where actual corrosives are handled as it would result in failure of the tank itself.

**Calendering**—With sheet linings such as rubber, neoprene and polyvinyl chloride, the sheets are formed by calendering thinner sheets under heat and pressure into sheets of the final thickness. The higher quality sheets are comprised of plies approximately 1/64 in. thick, calendered together to a total thickness of possibly 3/16 in. or 1/4 in. If any pinholes should be present in the original sheet before calendering, because of the heat and pressure, the chance for those pinholes to be evident after the calendering is almost impossible.

Moreover, it is possible to test for pinholes in sheet linings with a normal 15,000 volts. This is not possible with thin linings since the high voltage would of itself cause pinholes.

**Rubber Linings**—Of the materials mentioned above, rubber linings have

### When Specifying Changes in Old Tanks To Be Lined

1. When structural members, such as channels or angles are used back-to-back or as internal stiffeners, specify that they be seal-welded where they touch other metal.
2. Specify that all lap welds be seal-welded inside and outside.
3. Specify that all weld spatter and flux be removed.
4. Specify that all welds be ground suitable for the anticipated lining.
5. Specify that all sharp edges be ground to at least 1/32 in. radius.
6. Approach a riveted tank with a great deal of caution. All rivets and overlapping plates should be caulked tight and this may be a satisfactory preparation. Often, however, the "hats" on rivets and the discontinuity on laps present a crevice condition unacceptable to the lining. Once you start ringing the rivets with weld and seal-welding the laps, it is necessary to do the whole tank. Sometimes appropriate use of a mastic or sprayed metal can be used to mitigate problem.
7. Specify that all pockets, sections, and crevices be self draining.
8. Use mastics as fillers of fillets and cracks carefully and only in accordance with manufacturer's specs.

**Completed PVC sheet lining in a tank designed for use in nitric acid service**

had the longest acid service. Rubber linings are suitable for handling most inorganic acids except strong oxidizing acids such as nitric, chromic, and concentrated sulfuric.

In general, it has been our experience that rubber linings will handle higher temperatures than the synthetics, though the latter were claimed to be better when they first came on the market.

Where high temperatures are a problem, as in the case of a lining exposed to temperatures above 150 to 180 F, special high-temperature cementing processes are available. These will successfully prevent bond failure and the accelerated effects of oxidation, diffusion and absorption. More often, however, a carbon or acid brick sheathing is installed. The insulating properties of such a sheath serve to drop the temperature at the point of exposure. When the temperature of the solution is 212 F, the heat insulating properties of the brick reduce the temperature at the membrane to about 155 F, using a single course of brick, or to about 140 F, using a double course. An added and important feature of such a brick lining is the protection of the membrane against mechanical damage.

When natural rubber is not suitable as in the case of strong oxidizing acids, neoprene or polyvinyl chloride sheet materials will usually prove satisfactory. Both these, as well as natural rubber, are used extensively in severe immersion service.

One of the most important features about sheet rubber and neoprene is the fact that acid resistant cements can be used, thus minimizing underfilm corrosion when the sheet is mechanically damaged. This simplifies repair of the lining as well as the tank and is in direct contrast to the "thick linings" such as the plastisols and the bitumens.

**Fluorocarbon Plastic Laminate**— While there is very little, if any, actual experience with fluorocarbon plastic laminate (such as Kel-F) as a sheet lining, it is the most recent development in the field and appears to have excellent possibilities. A brief description of it is thus in order.

This material is impervious to the action of corrosive chemicals and highly resistant to most organic solvents at temperatures as high as 300 F. It has consistent high insulation resistance, high impact strength and is resistant to thermal shock.

The main property preventing its use to date has been the lack of cements or adhesives which would bond the material in sheet form to another material such as a steel tank. There are still no cements which will do this, just as there are still no solvents that can be used to soften it, but the problem has been overcome by molding the material to glass cloth and, in turn, cementing the glass cloth to the steel. The seams are heat sealed thus forming a continuous and pinhole free lining.

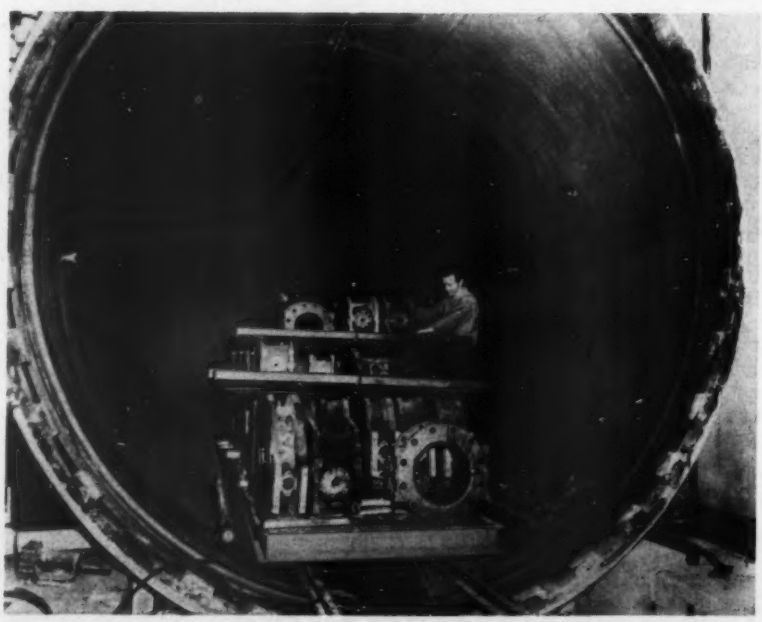
The main advantages of the laminate are as follows:

1. Impervious to a greater variety of pure and contaminated corrosives at higher concentrations than just about any other lining material.

2. Resistant to most of these corrosives at temperatures higher than the sheet linings presently used thus eliminating need for brick lining.

Main disadvantage of the laminate is the cost of the sheet and cost of its application. While the costs will no doubt be reduced in time by developments in application technique, etc., at the present time the cost of such an applied laminate lining is approximately four to five times that of sheet rubber or neoprene.

**Parts lined or covered with rubber are rolled into autoclaves for steam curing**



**Specifications**—In lining materials as well as anything else, there are differences in quality. In specifying these, therefore, it is well to look for quality both in the material itself and its method of application. For instance:

1. As mentioned earlier, sheets should be thin (approx. 1/64 in.) and calendered together in many plies to attain the desired thickness.

2. An acid-resistant cement should be used to bond the lining to the base steel. Then in case of mechanical damage to the lining the corrosive will not spread under the sheet but will be arrested by the cement. In addition, a sufficient number of coats of the cement should be used, for obvious reasons. Our company uses five coats of cement.

3. The lining should be cured if possible in an autoclave. The steam under pressure forces the rubber against the base steel thus increasing the bond strength between rubber and base metal as well as increasing the density of the rubber. Hot air cures will not produce the same result in the bond and have the further undesirable tendency to oxidize the surface of the rubber.

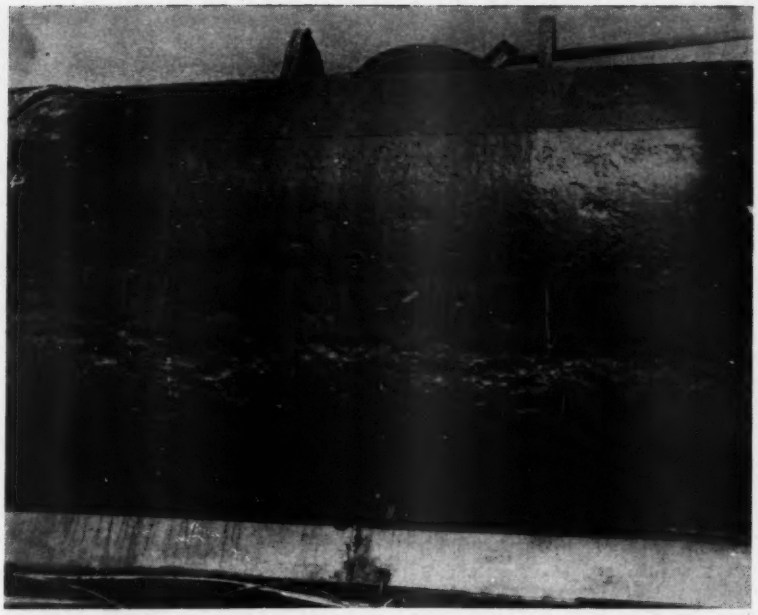
4. As stated previously, surface preparation of the base metal is extremely important since the lining can be no better than its adhesion to base metal. In the case of sheet linings, it is necessary that the metal surfaces be blasted to white metal and cements applied immediately to prevent oxidation of the metal and insure proper adhesion of the lining. Steel grit blasting is recommended to give a deep etch and to leave no blasting material on the surface.

In general, the above description covers quickly the subject of tank linings—with one important exception, namely the question of design.

**Design Considerations**—The problem of design has probably had more to do with the failure of otherwise adequate protective systems than anything else.

For instance, we have had many cases of tanks coming into our shop with the rubber lining still intact but the steel eaten away from the outside due to spillage or splash of acids. Such repairs are of course costly and in some cases the entire tank must be replaced. Chances are, all of this expense and lost production time could have been prevented if the outside of the tank had been covered with a few coats of vinyl at the time of the initial installation.

Insofar as the technique of applying linings is concerned, there are a number of precepts to observe. The fundamental principle in designing process equipment from the linings point of view is that all areas to be lined be as smooth as possible and all sharp edges and discontinuities of surfaces be eliminated.



**This is what can happen when the outside of a tank is not properly protected from acid spillage. Hydrochloric acid ate through the steel to the rubber lining**

This principle is relatively easy to apply in the design of future installations, provided that a lining has been anticipated, with the observation of a few simple guides as shown in the accompanying boxed material titled "When Specifying New Tanks That Are To Be Lined."

This specifications guide is very helpful, but a great deal of lining is done on existing vessels where conformance with these guides is woefully lacking, and even sometimes in new vessels, all of the above features may not be practicable. In these cases, the problems encountered in making all surfaces smooth and satisfactory for lining become quite complex and often a great deal of ingenuity is required to get a satisfactory surface. However, even here, there are some guides that can be followed. See the boxed material titled "When Specifying Changes in Old Tanks To Be Lined."

**Preventive Maintenance**—Anyone with a sizable corrosion protection problem should set up and administer a program of preventive maintenance. This is fundamental to good management.

Plant engineers should decide in advance on a schedule for draining all tanks and inspecting the linings. Repairs should be made on the spot of any flaws or mechanically damaged areas, then all of the tanks should be spark tested to discover and repair any weak spots unperceived by the naked eye. Such inspections can be scheduled for week ends, vacations, slack periods or other times when production facilities are normally shut down.

It has been our experience that such preventive maintenance coupled with proper initial planning and specifications is far less costly than waiting for a tank actually to start leaking, or a key process vessel to drop out of service when it is needed most.

**Inspection**—In the majority of cases, the purchasers do not have the facilities or the ability to embark on a comprehensive testing program of the materials to be used or of the applied linings, thus they are basically at the mercy of the applicator or contractor. The only answer to this problem is to deal with well established companies with good reputations and proven ability. This can be determined as one would check on new personnel, namely, by checking references. Never hesitate to call and ask about similar work performed by the people under consideration for other companies. When this is done, another step would be to physically inspect the facilities of the applicator to determine first hand how the work will be performed and, for example, in the case of sheet rubber or neoprene, how many coats of cement will be applied and whether or not an autoclave will be used to cure it. Time spent in this manner may save a great amount of time, headaches and expense at some future date.

On November 8th, the Cleveland Plant Engineers' Society was organized. Seated, l to r, are: J. S. Scott, Westinghouse Electric Corp.; K. W. Scott, Addressograph-Multigraph Corp.; C. F. Petzinger, Cleveland Twist Drill Co.; C. W. Zinger, Clark Controller Co.; D. L. Lawrence, Euclid Div., GMC; J. B. Frounfelker, Carling Brewing Co. Standing, l to r, are: E. J. Davies, Eberhard Mfg. Co., Div. of Eastern Malleable Iron Co.; P. P. Weidinger, Bailey Meter Co.; M. A. Luehrs, Dairypak, Inc.; C. H. Bartsch, Sherwin-Williams Co.; R. A. Harvey, Thompson Products, Inc.; A. L. Borgia, Weatherhead Co.; J. R. Mecredy, Cleveland Range Co.; W. W. Ferris, Electric Storage Battery Co.; R. E. Way, Celotex Corp.; R. L. Marinello, Plant Engineering Magazine; R. W. Hiller, of Dravo Corp. (Pittsburgh) and President of the AIPE

# Four in One Month—New Plant Engineers' Cl

Plant Engineers' Association of Central Connecticut was organized on November 13th. Seated, l to r, are: B. H. Sutphin, New Haven Copper Co.; R. C. Durand, Circuit Protective Devices Dept., General Electric Co.; S. J. Zelle, Seymour Manufacturing Co.; E. H. Drab, Footwear Div., U. S. Rubber Co.; T. O. Elliott, Southbury Training School. Standing, l to r, are: R. F. Bedell, U. S. Time Corp.; H. E. B. Anderson, Plant Engineering Magazine; R. W. Hiller, President of the AIPE; N. Timenes, Naugatuck Chemical Div., U. S. Rubber Co.; G. B. Lewis and L. Vander Eyk, both of the Bristol Co.; D. P. McCullough, Mattatuck Mfg. Co. Mr. McCullough was appointed temporary chairman of this group; L. Vander Eyk will be temporary secretary-treasurer. R. F. Bedell, chairman of the Constitution Committee, will be assisted by Messrs. Durand, Drab and Elliott in preparing the club constitution and by-laws

**On November 12th, the Bridgeport-New Haven Plant Engineers' Club was organized. Seated, l to r, are: C. D. Knott, American Steel & Wire Div., U. S. Steel Co.; L. A. Miller, Greist Manufacturing Co.; P. G. Damm, Merck Sharp and Dohme (Philadelphia), area representative of AIPE; M. L. Hedberg, Detroit Controls Corp. (Belknap Mfg. Works); J. Bayuk, Lycoming Div., Avco Manufacturing Corp. Standing, l to r, are: H. E. B. Anderson, Plant Engineering Magazine; H. M. Bradley, Manning, Maxwell & Moore, Inc.; V. T. Ford, Electric Shaver Div., Remington Rand Div. of Sperry Rand; R. W. Hiller, President of the AIPE; W. R. Phipps, Uarco, Inc.; C. Hayes, Bridgeport Brass Co.; J. Sikeritzky, Seamless Rubber Co. Hayes and Bayuk were appointed temporary co-chairmen of the newly-formed group**

# rs' Clubs Meet Demand for Local Groups

NOVEMBER WAS the month for organizing new plant engineers' societies. On November 8th, plant engineers in the Cleveland area attended an informal dinner meeting at the Hotel Cleveland. After a general discussion on organization, the men appointed W. W. Ferris temporary chairman and R. A. Harvey temporary secretary.

On November 12th, plant engineers from Bridgeport, New Haven and surrounding Connecticut towns met in New Haven for a dinner. Outcome of their discussion was the organization of the Bridgeport-New Haven Plant Engineers' Club, with C. Hayes and J. Bayuk, temporary co-chairmen.

Plant engineers of the Waterbury, Conn., area gathered to discuss the formation of a local plant engineers' group on November 13th. Discussion and favorable reaction of the group resulted in the selection of temporary officers to get the organization started. D. McCullough is temporary chairman.

Most recent of the clubs was organized on November 14, when plant engineers of the North Shore area of Massachusetts met in Danvers, Mass. J. M. Kohr, of Gorton-Pew Fisheries, was named temporary chairman.

**Organizational meeting of the Massachusetts North Shore Plant Engineers' Club, November 14. Front row, l to r, M. E. Johnson, General Electric Co.; A. Wise, Independent Tallow Co.; W. S. Baldus, United Shoe Machinery Co.; J. F. Erwin, Western Electric Co.; R. W. Hiller, President of the AIPE. Second row, l to r, M. Davis, Sylvania Electric Products; J. M. Kohr, Gorton-Pew Fisheries; L. Lane, CBS-Hytron; H. B. Ahlberg, Commercial Filters Corp. Third row, l to r, L. J. Monty, Artisan Metal Products; C. W. Crocker, CBS-Hytron; H. E. B. Anderson, Plant Engineering Magazine; R. C. Mounsey, Birds Eye Div., General Foods Corp.**

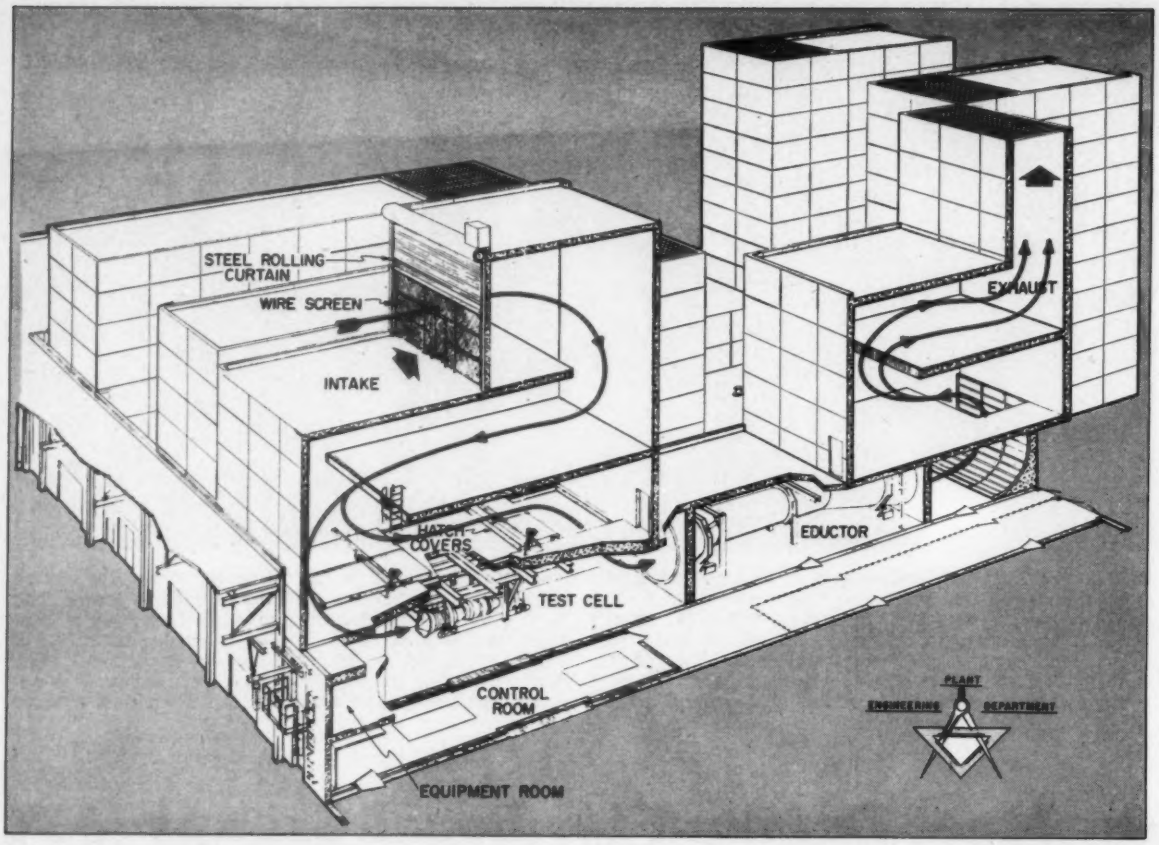



**Fig. 1. Sectionalized isometric view through test cells for jet engines at the Ford Aircraft Engine Division in Chicago**

# How To Control Industrial Noise

## Part III. Outdoor Noise Problems and Their Solution

**By DR. HOWARD C. HARDY, Consultant in Acoustics, Chicago, Ill.**

CONTRARY TO popular conception, not many industrial plants make noise in the surrounding community. The most extensive noise survey of a city in modern times was made under the author's supervision at the Armour Research Foundation. In this project, it was found that only 60 per cent of the plants surveyed in the City of Chicago made enough noise to be heard above the ambient noise of the community at the boundary of their plant. Most of the 60 per cent were bounded by other industries and only a few, it is estimated that this was on the order of 1 per cent, created a noise nuisance for nearby residences.

This observation applies to the comparative high noise background inside a large city. Noise standards for suburban areas and smaller cities are usually more rigid. No comprehensive data on these locations are available, but the reason why the number of complaints is small is perhaps due to the measures most companies take to make sure they are good neighbors.

External noise control is often a costly venture and even more costly if the surrounding community is sufficiently aroused. The purpose of this article, therefore, is to discuss how good acoustical engineering and analy-

**Table I. Limiting noise spectrum for residential-industrial boundaries in Chicago**

| Octave Band Frequencies (cps) | Below 75 | 75 150 | 150 300 | 300 600 | 600 1200 | 1200 2400 | 2400 4800 | 4800 9600 |
|---|---|---|---|---|---|---|---|---|
| Sound Pressure Levels (db) | 72 | 67 | 59 | 52 | 46 | 40 | 34 | 32 |

**Table II. This is the noise data calculated for the hypothetical power plant**

| Source | Sound Pressure Level at Source (150-300 cps band) db | Area sq ft | Sound Power watts | SPL at 600 ft (150-300 cps band) db |
|---|---|---|---|---|
| Top of stack | 90 | 100 | 0.01 | 44 |
| Breeching duct | 80 | 10,000 | 0.10 | 54 |
| Fans | 100 | 50 | 0.05 | 51 |
| Total | | | 0.16 watts | 56 db |

sis can accurately bring about satisfactory noise conditions at low cost.

First step is to set a realistic noise performance standard. Unfortunately, there have been no generalized legislative standards on this subject. There is a variation in the acceptance of noise by surrounding residents which ranges over 40 db. The biggest factor is the ambient noise of traffic and other urban activity.

The City of Chicago has pioneered a new zoning ordinance in which specific performance units are set for noise; air pollution, odors, and other nuisances. This states that *at the boundary line of a residence area* the noise from any plant shall not exceed that given in Table I.

This is the same curve as second from the bottom in Fig. 4 of the first article of this series[1]. For a boundary of commercial districts the numbers are seven decibels higher. These data were worked out after considerable study of what specific noise conditions in Chicago are considered acceptable. Field studies by real estate groups and industrial engineers have resulted in approval of this method of approach.

It should also be emphasized that the standard should not be based on the peak acceptable noise of nearby transportation systems such as that for passing trucks, airplanes, and diesel locomotives. It is one of those strange psychological phenomena that the public will accept much more noise from transportation devices than from industrial plants.

## Method of Analysis

The steps which the plant engineer should take in the analysis of a neighborhood noise problem are as follows:

1. Determine the design goal, how much noise in different octave bands will be acceptable.
2. Determine what noise sources exist (often these are more than one).
3. Measure the sound level from each source.
4. Compute the total sound power radiated by each source.
5. Compute the total intensity which will arrive at the nearest residences as a function of frequency, taking into account terrain features and meteorological conditions such as prevailing winds.

As an example, consider the hypothetical case (based on an actual problem) of a large open air power plant 600 ft away from a very quiet residential neighborhood. Complaints backed up by listening tests showed the power plant was making objectionable noise and the loudest frequency band was between 150-300 cps. The problem was to determine the noise source which needed to be treated. Three noise sources were evident: 1. the top of the exhaust stack; 2. the sides of the breeching ducts leading to the exhaust stack; and 3. opening of the intake ducts for the forced draft fans forcing air to the combustion chambers. Each of these had a different radiating area.

The sound power is given by:

$$P = S \frac{\text{antilog } \frac{SPL}{10}}{10^{13}}$$

where $S$ is the radiating area in square feet. The sound pressure level at 600 ft is given by Fig. 5 of the first article. One can see, from Table II, that although the sound level from the breeching ducts is twenty decibels lower than the fans close to the sources, their large area contributes more energy at a distance. The top of the stack is a minor noise source.

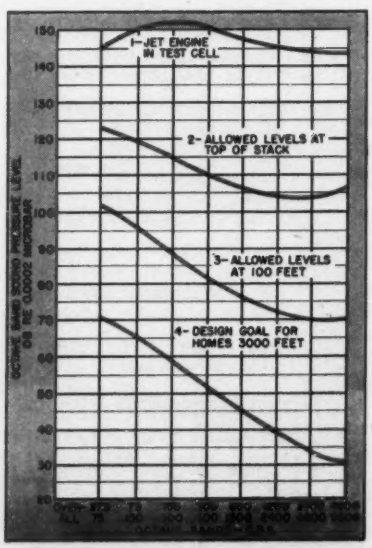
If the design goal for this job was, for example, 48 db, 10 db reduction of the breech duct noise and 7 db reduction of the fan noise should be adequate. The first could be accomplished by covering the breeching ducts with something similar to a thermal lagging. The second source could be reduced with a small amount of acoustical material in the intake duct of the fans. Nothing needs to be done to the exhaust stack.

In the particular problem, this type of analysis would be carried out for all the significant frequency bands and from this the required treatment could be prescribed. In certain cases, beaming effects and air absorption may be included.

**Table III. This is noise data calculated by the author for the jet engine silencer**

| Octave bands (cps) | 37.5 75 | 75 150 | 150 300 | 300 600 | 600 1200 | 1200 2400 | 2400 4800 | 4800 9600 |
|---|---|---|---|---|---|---|---|---|
| | Octave band sound pressure levels (db) | | | | | | | |
| 1. Design goal 3000 ft | 72 | 67 | 59 | 52 | 46 | 40 | 34 | 32 |
| 2. Inside test cell, afterburner on (no acoustical lining) | 146 | 150 | 152 | 150 | 148 | 146 | 145 | 143 |
| 3. Beaming at top of stack | -1 | -3 | -6 | -8 | -10 | -12 | -14 | -16 |
| 4. Air attenuation 3000 ft | | | | | -1 | -3 | -6 | -9 |
| 5. Inverse square attenuation | -56 | -56 | -56 | -56 | -56 | -56 | -56 | -56 |
| 6. Level at 3000 ft without quieting | 89 | 91 | 90 | 86 | 81 | 75 | 69 | 62 |
| Required Noise Reduction | | | | | | | | |
| 7. One cell operating | 17 | 24 | 31 | 34 | 35 | 35 | 35 | 40 |
| 8. Four cells operating | 23 | 30 | 37 | 40 | 41 | 41 | 41 | 36 |
| 9. Allowed level at top of stack | 123 | 120 | 115 | 110 | 107 | 105 | 104 | 107 |
| 10. Allowed level at 100 ft | 102 | 97 | 89 | 82 | 77 | 73 | 70 | 71 |

**Fig. 2. Jet engine noises compared with other noise levels in one engine plant**


1- JET ENGINE IN TEST CELL
2- ALLOWED LEVELS AT TOP OF STACK
3- ALLOWED LEVELS AT 100 FEET
4- DESIGN GOAL FOR HOMES 3000 FEET
OCTAVE BAND SOUND PRESSURE LEVEL DB RE 0.0002 MICROBAR

## Jet Engine Test Cells

The jet engine is the most powerful sustained noise source ever made by man. The effort the jet engine companies must make to quiet them becomes a major engineering undertaking of considerable expense, especially when many such testing stands are required. Although few other industries are ever required to make such efforts, the method of attack may be of interest since it can also be used to a limited extent on problems of lesser magnitude.

Noise spectrum of a large jet engine in a test cell is given in the upper curve of Fig. 2 and the second line of Table III. The design goal of Table I is shown in line one of Table III for homes 3000 ft away. If the exhaust stack is turned upward, a considerable part of the energy will be beamed upward, especially at high frequencies. The effect is given in line 3 of Table III. Also at the high frequencies there is considerable absorption in the air.

The inverse square attenuation is calculated on the basis of an exhaust opening 18 ft square. This is equiva-

[1] Part 1. How To Control Industrial Noises, November, 1956, Plant Engineering, pages 98, 99, 100, and 101.

**Table IV. Most common outdoor industrial noise problems and methods of solution**

| Source of Noise | Usual Cause | Suggested Treatment |
|---|---|---|
| 1. Open plant windows, metal forges, metal saws, etc. | Metal impacts | Closed windows with adequate ventilation; sound traps at windows, barrier walls |
| 2. Outside cranes and conveyors | Mechanical motion | Area isolation; quieter equipment; barrier walls |
| 3. Material handling | Impacts | Rubber lined containers and surfaces, enclosures |
| 4. Shake-out hammers | Impacts | Total or partial enclosure |
| 5. Electrical generators and transformers | Electro-magnetic | Barrier walls |
| 6. Pumps and compressors | Hydrodynamic | Enclosures, barrier walls, fluid mufflers |
| 7. Engine or steam exhausts | Gas turbulence | Industrial mufflers, silencing chambers, acoustically lined passages |
| 8. Air intakes for combustion | Gas turbulence | Same |
| 9. Ventilation intakes and exhausts | Gas turbulence water flow | Partial enclosures. New surface materials, acoustic traps |
| 10. Hydraulic flow through pipes | Turbulence through pipe wall | Acoustical pipe lagging, enclosure |

lent in area to a sphere of radius given by, $4\pi r^2 = 18^2$, or an effective radius of 5 ft. Since the sound spreads out uniformly, the inverse square law attenuation is 20 log (3000/5) = 56 db. The level that would exist at 3000 ft without quieting is given, therefore, by line 6, and the required noise reduction for one cell can be obtained by subtracting line one from line 6. If four cells can be conceived of as operating at one time, the noise would be six decibels higher and this much more reduction would be required.

For subsequent evaluation two more spectra are given. The first is the allowed level that should not be exceeded at the top of the stack. The same is also given for a distance of 100 ft. The latter data can be used as a design goal when monitoring the sound output to determine if the completed installation is satisfactory.

This amount of noise reduction of the exhaust stack, although large, can be accomplished several different ways. The use of large acoustically lined turns is usually found to be most economical. For instance, the large test cells of the Ford Aircraft Division, designed by the author, are shown in Fig. 1.

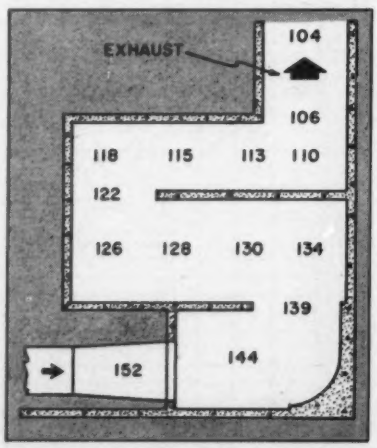
In these the exhaust gases with cooling air may be as high as a million cubic feet per second. These gases are passed through the exhaust labyrinth shown, the walls of which are lined with an absorptive material, specially designed to absorb the sound and at the same time withstand the excessive heat, heavy vibration, and high air velocities. By this means, a large proportion of the sound, of the order of all but one part per hundred thousand, is absorbed, and the gases are emitted to the atmosphere. The way the sound decreases through the cell is shown for the 300-600 cps band in Fig. 3. This reduction is even greater than that required by the analysis given (for another installation) in Table III.

A similar labyrinth quiets the intake path through which the combustion and cooling air pass. Large passages are needed because low velocities are desired.

It can be seen that good acoustic design always involves good mechanical design. Satisfactory materials and construction must be worked out which have low initial and maintenance cost. These requirements are particularly severe in the case of jet engine test cells where there are enormous vibrations and high temperature and velocity flow.

In Table IV most of the outdoor noise problems are listed and suggested methods of treatment given. The method of treatment required will depend on the results of analysis discussed above. Methods suitable for 10 db reductions will be futile where 25 db reductions are required. Since the cost usually goes up rapidly with the number of decibels and the size of the source, it usually pays to be deliberate about such problems.

**Fig. 3. The drawing shows the amount of sound decrease in the jet engine test cell as exhaust goes through labyrinth**




A large percentage of the outdoor noise problems are due to air or gas flow. The speed of such flow causes air turbulence or rapid fluctuations of pressure. Since sound is simply a rapid pressure fluctuation, turbulence and sound are synonymous. At low speeds, the sound intensity increases with the fifth power of the speed. This power becomes as high as the eighth power for velocities near the speed of sound. Where there is possibility of choice, therefore, low velocities are always to be recommended. It is always the highest velocity in the system which causes the noise. A low velocity duct system with an almost closed valve can be very noisy.

By use of mufflers; acoustic labyrinths, plena, and other types of traps; and by various "splitter" or baffle treatments, most noise in air flow systems can be adequately reduced. Often the main problem is to choose the economical and dependable system.

In some cases, when the noise source is close to the ground, the best solution is a barrier wall between the noise and the receiver. In many cases, the factory itself may provide such a barrier on one or more sides. The amount of noise reduction will depend on: 1. How close the sound source is to the wall. 2. Height of the source. 3. Height of the wall. Reductions between 6 and 15 decibels are possible.

In many cases a barrier wall can be of advantage in hiding the sources of sound. "Out of sight, out of mind" is an adage which is psychologically very applicable in many outdoor noise problems. For this reason, beneficial results in noise problems have been reported when shrubbery is used to hide the noise source, although such treatments have almost no acoustical value.

This brings us to one of the most important aspects of outdoor noise control problems. Someone has said that in most communities outdoor noise problems are twenty per cent engineering and eighty per cent public relations. This is approximately correct. The best kind of public relations, however, is based on good engineering. When a noise source has been reduced, it is usually good practice to let interested parties know what has been done and what has been accomplished. Sometimes an explanation of the importance of the task being performed and the reason why noise is associated with it will be of help. It should be remembered that once the community is sufficiently aroused, more quieting will be required than if the neighborhood relations had not deteriorated.

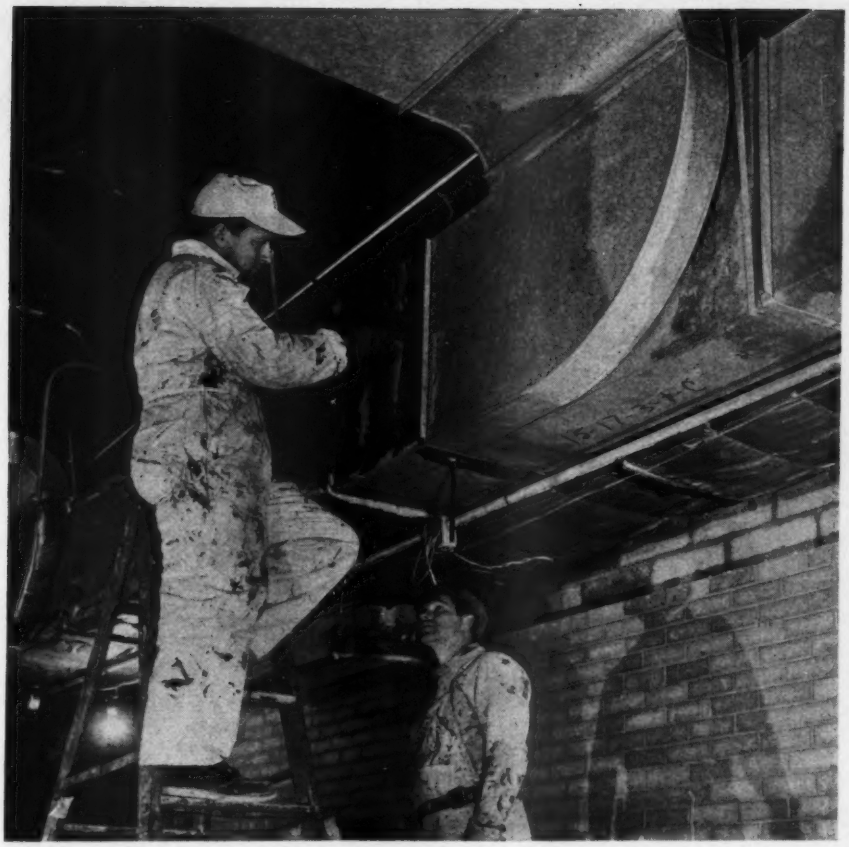


**Fig. 1. Adhesive is brushed on ductwork in striped pattern before applying the insulation. This particular adhesive has a long open drying time and good wet strength that permits a large area of ductwork to be coated at one time**

# How Adhesives Can Work for You

## Types Available, Characteristics, Uses and Applications

**By E. F. HESS, Manager, Adhesives and Coatings Division, Minnesota Mining & Manufacturing Co.**

ADHESIVES FIND widespread use and solve many problems in plant engineering, especially in applications involving the maintenance of equipment, services and structures and in the operation of plant utilities and services. Wherever a joining or holding job is done mechanically, there is a possible application for an adhesive.

Adhesives offer plant engineers such advantages as:

**Uniform Load Distribution**—Adhesives distribute the load evenly over the entire joint area. By giving continuous contact between mating surfaces, adhesives minimize local stress concentrations.

**Resiliency**—Residual elasticity of the adhesive bond absorbs some of the stresses created by flexing, vibration and difference in coefficients of expansion.

**Sealing and Protection**—Adhesives form a continuous film when applied to a surface. This film acts as a protective coating against corrosive gases, fluids, dusts and moisture. When two adhesive surfaces are joined, the adhesive film seals the joint, preventing the entrance of fluids or gases into the area between the joined materials.

**Easily Applied**—Adhesives are also easy to use. They can be applied rapidly with a brush or spray gun. The chief requirements are that the surface to which they are applied must be clean, and a short drying time (30 seconds to 5 minutes for most adhesives) must be allowed before the adhesive coated pieces are joined.

Insulation of ducts, tanks, storage rooms, pipes and processing equipment is a common problem facing the plant engineer.

The use of adhesives for installing the various types of insulation will insure complete contact between the insulating material and the base surface. Since they do not penetrate through the insulation they eliminate matting or crushing, and do not provide an avenue of escape for heat. Regardless of how low or how high the density of the insulation, it is held firmly in place, with the holding force distributed evenly over the entire surface. Also, there is no need to pierce the subsurface, thus keeping walls and ducts intact. Adhesives can be used for attaching nearly any type of batt, roll or board insulation to metal, wood, concrete or wall board.

One of the most widely used insulation materials is fibrous glass. It is often used to dampen sound and vibrating as well as providing a barrier to heat transfer. Typical examples of the use of fibrous glass in plant maintenance are: insulating duct work (high and low velocity); insulating walls of storage and constant temperature rooms; insulating heated pipes; insulating furnace and boiler jackets; sound dampening blower housings and plenum chambers; sound absorption in

## Here Is the Story—in Tabular Form—of How Adhesives Can Work for You

| TYPES OF ADHESIVES | TYPICAL USES |
|---|---|
| General Purpose Reclaimed Rubber Base Adhesive (High Viscosity Mastic Type) | Bonding wood block, vinyl tile, or linoleum flooring to wood or to concrete (above grade). Bonding high density insulation to porous surfaces. Bonding sheet wallboard. For bonding fiberboard and expanded rubber insulating materials to wood, steel, concrete and other construction surfaces. |
| General Purpose Reclaimed Rubber Base Adhesive (Low Viscosity Mastic Type) | Bonding many types of rubber sheet, sponge and weatherstrip to metal, concrete, wood, etc. For bonding cloth, cardboard, asphalt impregnated fiberboard and sound deadener pads to wood and metal. Laminating insulating paper, packaging paper, and holding lightweight insulation. For bonding linoleum to metal, felt to glass, etc. The slight pressure-activation characteristics, which remain in this adhesive for several minutes after the solvent has evaporated, allows the bonding of vapor-barrier type insulating materials without trapping solvents underneath. |
| Water Dispersed Mastic Adhesive | Bonding sound deadener pads, flexible insulating materials, rubber and linoleum flooring to metal, dry wall construction surfaces, concrete and wood. High and low density fibrous glass insulation. |
| High Wet Strength Mastic Adhesive | Heavy-bodied mastic adhesive with high immediate wet strength for bonding perforated metal plates used for hanging batt-type insulation. Also used for heavy cork-board insulation. |
| Oil Resistant Synthetic Rubber Adhesive | Resists plasticizing oils, lubricating oils and gasoline which makes it suitable for bonding most types of vinyl sponge sheeting insulation. |
| Heat Resistant, Low Flow Synthetic Rubber Adhesive | Bonds fibrous glass, linoleum, low pressure laminates and fiberboard to wood. |
| Heat Curing Synthetic Resin Adhesive | For bonding metal to metal, and metal to wood where flexibility is not too important. |
| Two Part Chemically Curing Synthetic Resin Adhesive | High strength bonding of aluminum, steel, brass and other metals to themselves, glass and rigid plastic materials. |
| Transparent Synthetic Resin Adhesive | For adhering and overcoating labels affixed to fiberboard, wood, steel and galvanized surfaces. |
| Clay Tile Adhesive | Ceramic tile adhesive for wall tile. |
| Clay Tile Adhesive | Ceramic tile adhesive for installing floor tile. |

## For Best Results—Use the Right Adhesive for the Right Job

| CHARACTERISTICS | APPLICATION METHODS | SOLVENT |
|---|---|---|
| This adhesive is a rapid drying mastic or "combining" type adhesive. High wet strength and rapid drying, with a resulting fast strength gain, are its chief assets. Sets to a very firm, water resistant bond. | Trowel<br>Spatula<br>Pressure Flow | Petroleum Naphtha<br>Distillation Range<br>145 - 215 F |
| Versatile in use. Develops aggressive tack or stickiness rapidly. Good immediate bond strength. When sprayed, a gobby spray pattern is obtained. Gives a rubbery, watery resistant bond. | Brush<br>Spray<br>Flow | Petroleum Naphtha<br>Distillation Range<br>145 - 215 F |
| Heavy-bodied. Offers good immediate wet strength. Nonflammable during application. Can tolerate a small amount of oil on metal surfaces without seriously impairing adhesion. | Trowel<br>Brush<br>Spray<br>Roll-coat | Water |
| High wet strength, rapid strength gain mastic. | Trowel<br>Spatula | Petroleum Naphtha<br>Distillation Range<br>145 - 215 F |
| This adhesive provides good resistance to most plasticizers used in vinyl plastics and also has excellent resistance to aromatic fuels such as aircraft gasoline. Rapid drying. Tack range is generally short. | Brush<br>Flow | MIBK (Hexone) |
| Provides long open time when coating both surfaces; good heat resistance (250 F with fibrous glass insulation), low degree of flow. Is flame retardant when dry. | Brush<br>Spray | Petroleum Naphtha<br>Distillation Range<br>203 - 262 F |
| High shear strength, somewhat brittle, heat curing, good water and moisture resistance. | Brush | Butyl Alcohol |
| Resists many acids and alkalis. Provides shear strength up to 2000 psi. This material requires an accelerator. | Brush<br>Scraper<br>Spatula | No organic solvent |
| Good water resistance .Withstands temperatures of –25 to 140 F without failure. Resists oil. Ages well. | Brush | Ketone and aromatic blend |
| This adhesive has excellent bonding properties, spreads easy, has long bonding time. It is versatile, tough and resilient, durable, heat resistant and time saving over mortar. | Notched trowel | Petroleum Naphtha |
| Allows installation of ceramic tile floors on a variety of subfloors, including plywood, concrete, terrazzo, etc. | Notched trowel | Petroleum Naphtha |

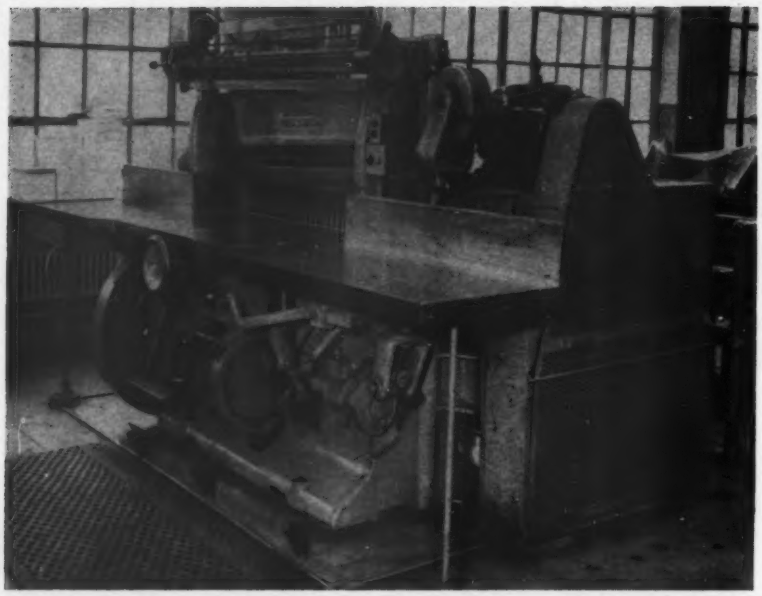


**Fig. 2. Rubber pads are adhesive-bonded to the machine and the machine foundation surface to provide a shock absorbent mounting for the machine. This method of installation eliminates bolting the machinery to the floor. The adhesive used in this application has good resistance to cutting oils and lubricants**

offices and studios; and insulating metal buildings.

In each of these applications the fibrous glass can be applied with an adhesive. When a low density fibrous glass is used, a fluid brushable adhesive usually works best. By applying the adhesive to one or both surfaces by brush or spray gun and immediately pressing the insulation into place, it is possible to save a great deal of time and labor, even on relatively small jobs.

When using high-density or rigid fibrous glass insulation a heavy bodied, high wet strength adhesive is preferred. This type of adhesive is easily applied by using a notched trowel or high pressure spray equipment. Commonly referred to as "mastic" type adhesives, these high viscosity adhesives can support the weight of high-density fibrous glass even when wet.

Wallboard, decorative high pressure laminates, vinyl, rubber, asphalt, and linoleum for covering walls and floors, as well as ceramic tile, can all be installed with adhesives without sacrificing strength or causing unsightly perforations. This is a great advantage when remodeling office, storage or laboratory areas. New wall surfaces can be installed, or new floor coverings laid over existing floors without tearing out present surfaces.

Different adhesives are available for best results with any one particular wall covering. High pressure decorative laminates for example, should be bonded with a "contact bond" type cement. This is an adhesive that can be applied to both surfaces, allowed to dry until the adhesive film show no stickiness and then the two surfaces are pressed together.

This adhesive has a great affinity for itself and as soon as the two adhesive coated surfaces come in contact with each other, they join with an extremely high degree of strength. This kind of adhesive is necessary to eliminate the inherent warp of high pressure laminates and keeps them from pulling up at the edges.

Adhesives for wallboard are usually heavy bodied or "mastics." With flat, rigid wallboard, the adhesive is combed onto the wall with a notched trowel and the wallboard pressed into contact. With semi-flexible wallboard, it may be necessary to shore the wallboard up over night.

### Floor and Wall Coverings

Floor coverings of all kinds can be laid with adhesive. Here again, the simplest method is to apply the adhesive to the floor with a notched trowel and set the floor covering in place. Some adhesives for this use are so designed that they will hold a floor tile in place even while wet, but will also allow the tile to be picked up and relaid if they are improperly located the first time.

Ceramic tile is an excellent wall covering for work areas where fluids or chemicals are used or for laboratory areas. One of the newer adhesives is designed for applying such tile directly to the existing wall surface. Applied by notched trowel, this adhesive will hold the tile firmly in place as soon as the tile is pressed into contact, and once the adhesive is dry will provide strength in excess of a ton per tile. A similar adhesive can be used for adhering ceramic-mosaic tile to floors.

The wide variety of adhesives available to the plant engineer today allow many small jobs to be done easily and economically. Of particular interest is the use of an adhesive and firm rubber pads for mounting heavy machinery on concrete floors. Normally a heavy piece of machinery is bolted to the floor with lag bolts. This requires drilling into the concrete and results in any vibration from the machine being transferred directly into the floor.

Using the rubber pads, the machine can be mounted by first bonding the pad to the floor and then bonding the machine to the pad. Two things are accomplished; the floor is not drilled, and the rubber pad acts as a cushion or vibration damper. A fuel and lubricant resistant adhesive has been used for years in this operation with no difficulty, and prevents all lateral movement of the machines.

Coatings and sealers, which are near cousins to adhesives, also find many uses around an industrial plant. In one case, an abrasion resistant coating was applied to the inside of grain storage elevators to prevent erosion and corrosion of the metal walls.

Sealing of openings in wood or concrete floors, around windows or outside wall panels is another job which can be performed quickly and easily with a number of industrial sealers available on the market today.

**Fig. 3. Openings at the seams and along walls of wood flooring sealed with an abrasion and moisture resistant coating**

# Bolts vs. Rivets

## Double Production With Half the Crew Achieved on Allen Plant Structure

TWO THREE-MAN bolting gangs, using automatic torque control tools, have run approximately 40,000 high tensile steel ⅞-in. bolts in 40 working days at Allen Plant, major power plant construction project of the Duke Power Company. Although the crews are half the size of the normal six-man riveting gang, the rate of production is double the riveters' speed.

At Allen Plant, the tools are set to produce a bolt tension in excess of 37,000 lb, the minimum suggested by the Research Council on Riveted and Bolted Structural Joints for the calibration of wrenches. The two wrenches are checked each morning before starting work by running three or four bolts on a hydraulic calibrator which gives a direct reading on bolt tension.

This procedure is followed not just as a check on the tools but to also determine whether any change in the bolts, nuts or washers being used necessitates a change in wrench torque to achieve the desired tension. Erection Superintendent Tate Rust reports that it has not been necessary to alter the tool torque setting more than once a week. When a change is required, it is done in a few seconds on a simple jig by altering the twist in the torsion bar.

Erection of the steel columns was begun on April 18 and bolting began about a month later. When possible, the erectors were given the right length high tensile bolts to use in fitting up the steel. These were left in as part of the permanent installation. The bolting gang of two operators and a helper follow and install the remaining high strength bolts, putting the wrench on the fitting up bolts also to bring them to required tension. If the proper high strength bolts were not available to the erectors, the bolting crew removes the fitting up bolts and replaces them with high strength bolts.

Working up in the air, with scaffolding to hang and move frequently, the three-man team with its single automatic torque control, Impactool averaged better than 400 bolts a day. When the gang worked on the mezzanine floor, with no scaffolding to bother with, the men could run 40 bolts on a beam and move right on to the next beam. Here the new torque control had a chance to show its speed. Under these conditions, on a time trial, one crew put in 200 bolts in 20 minutes flat, an average of 10 bolts a minute. In part, this was possible because the operator could run the tool at full speed, keeping it on the nut the precise number of seconds needed because the tool shut off the instant it reached the preset torque.

Averaging work in the air and on the floor, the two gangs have run about 1,000 bolts a day, a total of around 40,000 for the 40 working days. The rate achieved is roughly double what riveting gangs twice the size normally produce. It is possible that even more bolts might have been run had not the steel shortage reduced the pressure for production.

**Bolting crews have run 200 bolts in 20 min flat when working on mezzanine. In the air they've averaged 400 a day**

**Wrenches are checked each day before work starts by running three or four of the nuts on a hydraulic calibrator**

# Activities of Plant Engineers' Societies

**Here are recent reports from 12 of the more than 30 Plant Engineers' Societies organized throughout the United States and Canada . . . Also, names of new officers for the coming year**

AS THE NUMBER OF Plant Engineers' Societies increases so will their activities. Following is a brief report of what some of these Societies are doing:

### Los Angeles

Members and guests of the Plant Engineers' Society of Los Angeles received some inside information on an accountant's viewpoint of plant engineering.

Mr. Fred W. Mill, Division Controller and Assistant Secretary, Republic Supply Co., Torrance, California, presented an interesting talk on the subject: "Plant Engineering Responsibilities for Company Over-All Operations from an Accountant's Viewpoint."

### Dayton

New officers for the Plant Engineers' Club of Dayton for the 1956-1957 term are:

F. Detrick, Precision Rubber Products, president; A. J. Sentena, United Aircraft Products, vice president; and J. F. Randolph, Duriron Co., Inc., secretary-treasurer.

### Merrimack Valley

The Plant Engineers' Club of Merrimack Valley scheduled a tour of the General Electric Co. facilities in Lowell, Massachusetts, for one of its meetings.

They also had their election of officers at this meeting. J. R. Merrill, of J. F. McElwain Co., was elected president; W. M. Kell, of General Electric Co., vice president; and R. Lucier, of Commodore Foods, Inc., secretary-treasurer.

### Dallas and Fort Worth

New officers for the Plant Engineers' Society of Dallas and Fort Worth for the 1956-1957 year will be:

R. J. Eichner, of Procter & Gamble Mfg. Co., president; P. W. Howe, of Ford Motor Co., vice president; and A. M. Eberle, of The Ruberoid Co., secretary-treasurer.

### Milwaukee

E. J. Nygren, of Ben-Hur Mfg. Co., will take over the duties of president for the Plant Engineers' Society of Greater Milwaukee. He will be assisted by J. Jacques, of Lakeside Laboratories, Inc., the new vice president; R. Hofmann, of Pittsburgh Plate Glass Co., the new secretary; and G. Brown, of Wisconsin Bridge & Iron, the new treasurer.

Board Members will be F. Trubshaw, of Galland-Henning Mfg. Co.; R. M. Berry, Plankington Packing Co.; and R. G. Zarling, of American Motors Corp.

### Union-Middlesex Counties

New officers for the Union-Middlesex Plant Engineers' Association will be:

F. Marken, of General Motors, president; S. Whitehead of Calco Chemical, secretary; and J. Tammaro, of National Lead Co., program chairman.

### Gulf Coast

Officers elected at a recent meeting of the Gulf Coast Plant Engineers' Association are:

R. Kent, Champion Paper & Fibre Co., president; E. H. Pace, Emsco Manufacturing Co., vice president; and L. H. Grisso, Uvalde Rock Asphalt Co., secretary.

### New York

New officers for the Plant Engineers' Association of Metropolitan New York are:

H. F. Harman, of E. I. du Pont de Nemours & Co., Inc., president; E. C. Bannan, of Wright Aeronautical Corp., secretary-treasurer.

### Detroit

At a recent meeting of the Plant Engineers' Society of Detroit, the following officers were installed for the 1956-1957 season:

R. A. Melton, Chrysler Corp., president; F. P. Adams, Calumet & Hecla Consolidated Copper Co., vice president; V. H. Chisholm, American Motors Corp., secretary; and F. W. Pfau, International Salt Co., treasurer.

Board Members will be: W. C. Klein, King Seeley Corp.; I. E. Packard, R. C. Mahon Co.; and B. J. Smith, Pittsburgh Plate Glass Co.

### Central Indiana

At the first fall meeting of the Central Indiana Plant Engineers' Society the following officers were elected for the 1956-1957 term:

J. K. Keys, of Western Electric Co., president; S. R. O'Haver, International Harvester Co., vice president; and R. S. Bosart, Adams Div., LeTourneau-Westinghouse Co., secretary-treasurer.

### Twin City

Results of the recent election of officers for the Twin City Plant Engineers' Society are:

G. R. Carpenter, Minneapolis-Moline Co., president; R. O'Brien, Anderson Corp., vice president; B. J. Robichaud, Toni Co., secretary; and R. W. Kaeli, Minneapolis Electrical Steel Castings Co., treasurer.

Members and guests of the Twin City Plant Engineers' Society heard an interesting presentation by Mr. Randall of the Portland Cement Association at their last meeting. Mr. Randall's subject was: "The Durability of Concrete Surfaces." He discussed the weathering (spalling and salt action) of outdoor concrete surfaces. After his presentation, members had an opportunity to discuss their individual problems with the speaker.

### Niagara Frontier

The second fall meeting of the Niagara Frontier Society of Plant Engineers was held at the Boot and Saddle Club.

Guest speaker was Mr. O. W. Graveley, Coordinator of Maintenance Operations for the Electro Metallurgical Company plants. His topic for discussion was: "Maintenance in Government versus Maintenance in Industry."

Many readers may recall meeting Mr. Graveley at last year's All-Engineers' Luncheon held at Convention Hall, Philadelphia, on the second day of the Plant Maintenance and Engineering Conference. Mr. Graveley, who was then Director of Maintenance in the Department of Defense, monitored the panel program which discussed "Maintenance Management and Cost Control in the Armed Forces."

# Bit manufacturer bites off 20% production increase

*SUPERLA Soluble Oil plus technical service add up to improved product output at Chicago Brunner & Lay Rok-Bit Corp.*

George P. Gaunt (right) shop superintendent shows rock bit to Joseph D. Grigas, Standard Oil industrial lubrication specialist. Joe is well qualified to assist customers. He has 13 years' experience in such work, has a degree in engineering from Illinois Institute of Technology and is a graduate of the Standard Oil Sales Engineering School.

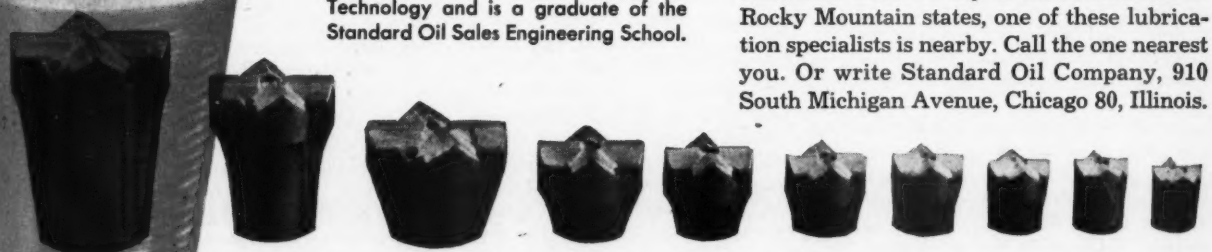
SUPERLA Soluble Oil, which is now being used by Chicago Brunner & Lay Rok-Bit Corp., has solved a lot of milling machine operating problems for the Company. Soluble oils formerly used separated out of emulsion and turned rancid in use. Oil circulating lines plugged repeatedly. The plant's production rate was not up to capacity because of frequent shutdowns for cleaning of machines and for unplugging of oil lines.

**On the advice** of Joe Grigas, Standard Oil industrial lubrication specialist, the Company cleaned the machines, then converted them to SUPERLA at a 10:1 dilution.

**This is how** the change-over worked out. *Production was increased 20%.* Machine down time was substantially reduced. The Company was sufficiently pleased with the performance of SUPERLA Soluble Oil in milling machines to convert two grinding machines to this oil. Results obtained on the grinding machines: excellent wheel life, good finish and rust protection.

SUPERLA Soluble Oil emulsifies readily with all types of water. It is a stable oil and forms stable emulsions. It does not tend to develop objectionable odors in use nor is it injurious to men, work or machines. SUPERLA Soluble Oil gives good tool life and prevents rust.

**Get the facts** about SUPERLA Soluble Oil. Your Standard Oil industrial lubrication specialist has them. In any of the 15 Midwest or Rocky Mountain states, one of these lubrication specialists is nearby. Call the one nearest you. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



***Quick facts about***

**SUPERLA Soluble Oil**

- Emulsifies readily
- Forms stable emulsion
- Doesn't turn rancid
- Economical. Requires low emulsion concentrations
- Prevents rusting
- Non-injurious to men, machines, work
- Gives good tool life

STANDARD

**STANDARD OIL COMPANY**
(Indiana)

**For more facts circle 563 on Reply Card**

# Acrylic Plastics —

## Characteristics and How These Plastics Can Help in Plant Maintenance Work

RESULTS OF A survey, asking PLANT ENGINEERING readers their use of and familiarity with plastics for in-plant applications, were reported in the October, 1955 issue.*

It disclosed, logically enough, that plant engineers who understood the virtues and limitations of plastics, used them frequently and successfully. But the survey also revealed that, to many other plant men, plastics are unfamiliar materials whose identities and properties seem to be as obscure as the ingredients of hash.

This article will describe the properties and suggest uses for one family of plastics, the acrylics, which have the familiar trade names—Plexiglas and Lucite. Because the plant engineer will not be concerned with using acrylic in the form of molding powder, the comments here will be confined to cast sheet as stocked by plastics dealers generally.

**Table I. These thicknesses are recommended for minimizing breakage due to impact of stones, tools, hailstones**

| Sheet Size | Thickness |
|---|---|
| Up to 12 in. by 12 in. | 0.125 in. |
| Up to 24 in. by 36 in. | 0.187 in. |
| Up to 36 in. by 60 in. | 0.250 in. |

All plastics offer, in varying degree, light weight, impact resistance, corrosion resistance, formability and machinability. The principal advantage of the acrylics is that they offer these properties plus outdoor stability, clarity, and an availability in a wide range of thicknesses and sheet sizes. The clear sheet is available in sizes up to 100 by 120 in., and in thicknesses up to four inches. It is manufactured in flat sheet only, but is also supplied in 2½-in. or in 1-in. corrugations by fabricators. Table 3 presents the physical characteristics which are important in plant service.

Acrylic plastics offer an unusual combination of properties. They combine almost perfect transparency; shatter resistance from impact, twisting and vibration; high resistance to acids, alkalies and corrosive chemicals; excellent resistance to weathering and industrial atmospheres; temperature resistance up to 200 F; good dielectric qualities; easily sawed and drilled with conventional wood-working tools; and formability with simple tools into a variety of shapes.

The mention of window glass recalls that about half of those who responded to the earlier survey were using plastics for glazing windows or skylights. It should be stated at once that acrylic plastic has not been a standard replacement for glass for ordinary applications. But in high-breakage areas, the shatter resistant plastic will save money by eliminating the recurring cost of replacing ordinary glazing. Such savings have become even more pronounced with the recent introduction by Rohm & Haas Co., manufacturer of Plexiglas, of low-cost acrylic sheet, Plexiglas R. This material is suitable for all applications where ultimate optical and surface qualities are not important, but otherwise it is identical with the standard material.

Acrylic plastic material can be installed in wood or metal frames, puttied in with glazing points and metal clips or with a continuous glazing bead. When installing the glazing be sure to allow enough room for the plastic to expand and contract freely with temperature changes.

Proper installation practice varies with the size of the pane. For panes up to 2 ft long, the plastic should be cut approximately ⅛ in. shorter than the sash opening in both dimensions. The rabbet should be at least ⅜ in. deep. Use a permanently soft glazing compound. For panes between 2 and 4 ft, the plastic should be cut approximately ¼ in. shorter than the sash opening in both dimensions. The rabbet should be at least ¾ in. deep.

Use continuous glazing bead or sheet metal angles, with cork neoprene tape as the sealer. Do not use glazing compound, because it tends to separate under the greater expansion and contraction of the larger sheets. For panes larger than 4 ft, special installation methods may be required and it is advisable to obtain specific recommendations before proceeding.

Window breakage results from two types of causes: (1) breakage due to twisting of frames, vibration, shock and thermal expansion; (2) breakage due to impact of stones, tools, hailstones, balls, etc. Different thicknesses of acrylic sheet are recommended to withstand breakage from these two types of causes. These are listed in Tables 1 and 2.

Plant windows are often glazed with transparent, tinted or translucent material, which has the dual effect of reducing sky glare, thus producing better working light, and of diminishing worker fatigue caused by intense glare.

**Table II. Thicknesses recommended for minimizing breakage due to twisting of frames, vibration, thermal expansion**

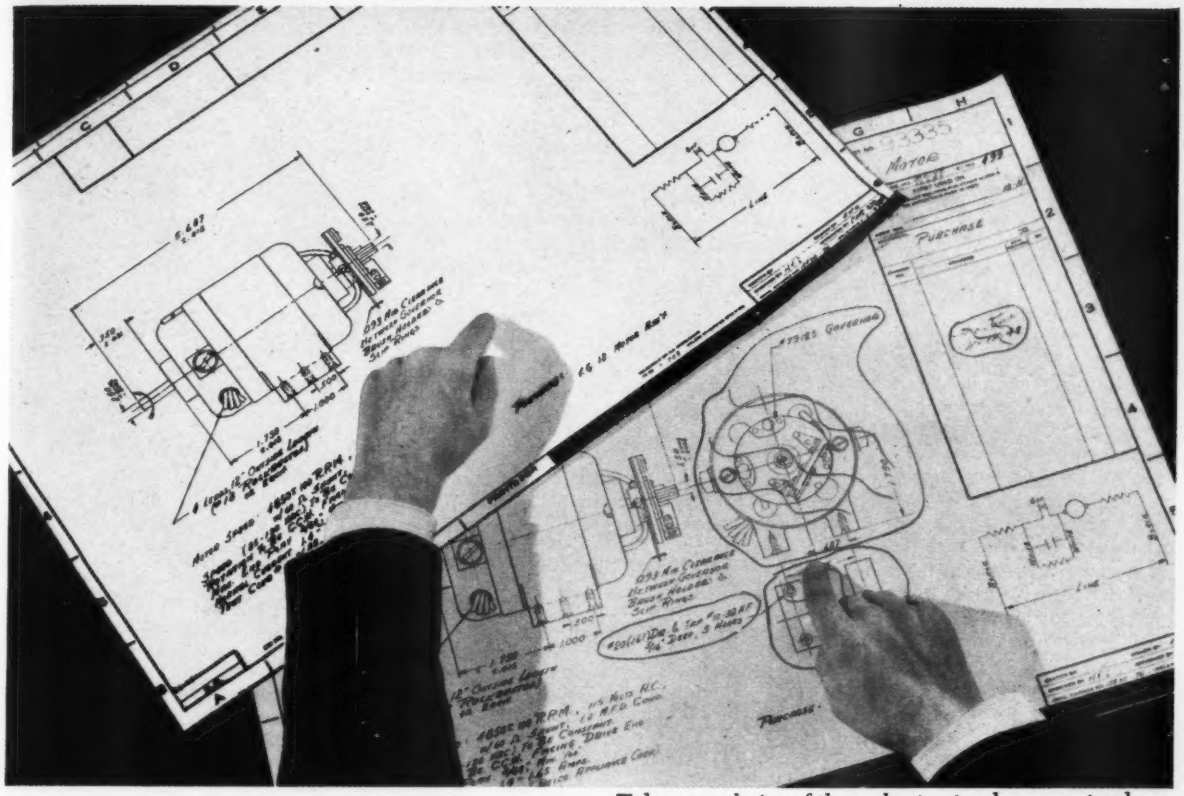
| Sheet Size | Thickness |
|---|---|
| Up to 12 in. by 18 in. | 0.100 in. |
| Up to 18 in. by 24 in. | 0.125 in. |
| Up to 24 in. by 36 in. | 0.187 in. |
| Up to 36 in. by 60 in. | 0.250 in. |

In an eastern steel mill, employees reported that a window bay glazed with translucent acrylic plastic sheet let in more light than had the former clear space. Actually this was an illusion, traceable to the fatiguing high-contrast pattern of brilliant glare and deep shadow which had existed before the opening was glazed! Where visibility is required, a transparent, clear gray-tinted sheet may be used.

Acrylic plastic withstands high impact but, like any other material, it can be broken. An important safety feature of acrylic plastic, when subjected to impact beyond its limits, is the manner in which it fractures. It holds together into relatively few large pieces, thus reducing the number of potential missiles. Because of the light weight of the material, these pieces scatter with a relatively low velocity which aids materially in reducing the chance of serious personnel injury and property damage.

For plants where a high explosion hazard exists, special glazing techniques are used. These are based on calculating the relationship between the edge engagement of the pane and the size and thickness of the pane so

* "Plastics Problems Pester Plant Engineers" appeared in the October, 1955 issue of PLANT ENGINEERING, beginning on page 118.



# 2 easy ways to drop out unwanted detail

Take your choice of these short cuts whenever standard drawings must be modified . . . or parts of a design must be eliminated.

**1.** Reproduce the drawing on Kodagraph Autopositive Paper—you get a positive photographic intermediate directly, with dense black lines on a clean white translucent base. Scissor out the unwanted detail . . . and make another Autopositive Paper print. Lots easier than redrafting—and so is the alternate method.

**2.** Reproduce the drawing on Kodagraph Contact Paper, Fine Line. You get a negative with clean open lines on a dense black background. Now "opaque out" the unwanted detail . . . and reproduce the print on Kodagraph Contact Paper, Translucent.

*After either step,* you merely add the new design . . . and your print-making "master" is ready.

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as to permit the panes to blow out under a specific back wave intensity, and thus dissipate the explosion shock wave to the outside of the building. For this application, automatic window latches which release at a specific pressure are also commonly used.

Although Plexiglas is rated as a slow-burning plastic, it is combustible and should not be used in windows or doors which must have a fire-resistance rating.

Skylight glazing with this plastic commonly answers one of two needs: either to avoid the breakage of glass caused by repeated distortion of the frame as it is raised and lowered for ventilation purposes; or to improve lighting in work areas with glare-trapping translucent material.

Another application which can save the maintenance department hours, dollars and headaches is the glazing of plant doors which are subject to repeated slamming, or are bumped open by material handling trucks. This impact resistance is a valuable asset also in glazing the cabs of cranes, and the side and rear windows of dump trucks.

### Other Applications

Where broken light bulbs or fluorescent tubes can contaminate foods or materials below or cause costly stoppage of production lines, many plant engineers suspend a sheet of clear plastic beneath the light fixture. Fabricators often heat-form lids to fit over bakery dough troughs.

Protective uses in other directions, involving resistance to acids or caustics, are almost numberless. A manufacturer of dry cell batteries has installed 2000 linear feet of acrylic plastic shields to protect assembly workers from possible spattering. Etching processes employing corrosive chemicals, such as in the production of printed-circuit assemblies, often use transparent plastic sheet for a protective screen.

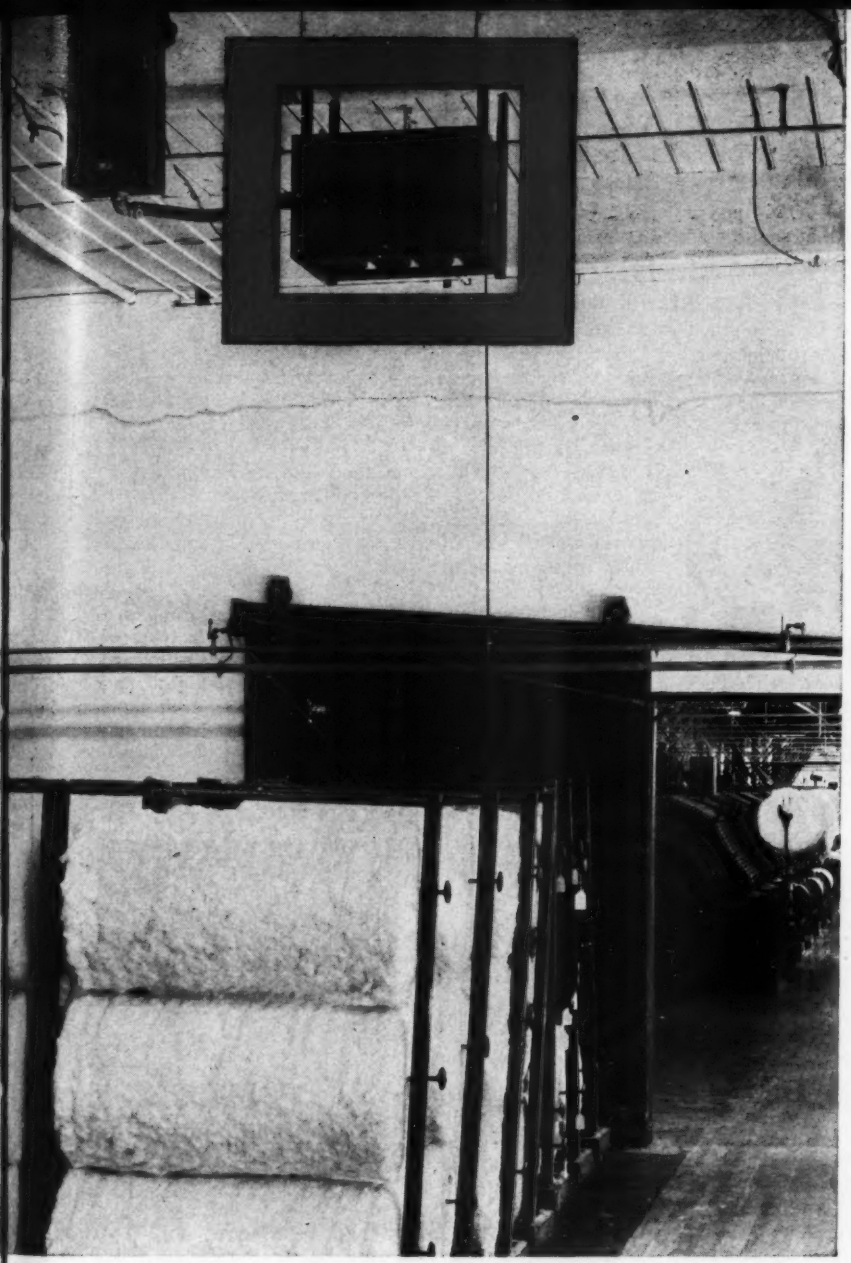
The high impact- and shatter-resistance of acrylic plastic has many safety applications. The most familiar is the guard over a table saw or other machine where the operator must see what he is doing, yet be protected from the cutting edge and flying particles. This application is also common in plants which test television tubes; here, the plastic shields are set up to stop flying splinters of glass should a tube accidentally implode.

The same plastic has become standard equipment for inspection windows on pump housings, mixers, ducts and enclosed conveyor systems. A large manufacturer of electronic equipment has surrounded his punch presses with "shrouds" of this material to cut down the transmission of noise.

**Table III. List of the physical characteristics of Plexiglas II and Plexiglas R will indicate the variety of applications for which this material is suitable**

| Property | ASTM Method | Average Values Plexiglas II UVA and Plexiglas R 0.250 in. |
|---|---|---|
| Hot Forming Temperature | — | 290-360 F |
| Tensile Strength | D638-46T | |
| Rupture | | 10,500 psi |
| Modulus of Elasticity | | 450,000 psi |
| Flexural Strength | D790-45T | |
| Rupture | | 16,000 psi |
| Deflection at Rupture | | 0.6 in. |
| Modulus of Elasticity | | 450,000 psi |
| Compressive Strength | D695-44T | |
| Yield | | 18,000 psi |
| Modulus of Elasticity | | 450,000 psi |
| Compressive Deformation | D621-48T | |
| Under load | | |
| 2000 psi at 50 C, 24 hr | | 0.2% |
| 4000 psi at 50 C, 24 hr | | 0.5% |
| Shear Strength | D732-46 | 9,000 psi |
| Impact Strength | D256-47T | |
| Charpy Unnotched ($\frac{1}{2}$ in. by $\frac{1}{2}$ in. section) | | 3.5 ft/lb |
| Izod Milled Notch | | 0.4 ft/lb/in./notch |
| Rockwell Hardness | (R&H P-20) | M-93 |
| Barcol Number | | 49 |
| Specific Gravity | D792 | 1.19 |
| Heat Distortion Temperature | D648-45T | |
| 2 C/Min – 264 psi | | 205 F |
| 2 C/Min – 66 psi | | 225 F |
| Maximum Recommended Continuous Service Temperature | | 180-200 F |
| Coefficient of Thermal Expansion | (R&H P-4A) | |
| Inches/Inch/F | | |
| —40F | | $2.8 \times 10^{-5}$ |
| —20 | | $2.9 \times 10^{-5}$ |
| 0 | | $3.1 \times 10^{-5}$ |
| +20 | | $3.3 \times 10^{-5}$ |
| +40 | | $3.6 \times 10^{-5}$ |
| +60 | | $3.9 \times 10^{-5}$ |
| +80 | | $4.2 \times 10^{-5}$ |
| +100 | | $4.6 \times 10^{-5}$ |
| Coefficient of Thermal Conductivity $\frac{\text{Btu}}{(\text{Hr})\ (\text{Sq Ft})\ (\text{F/in.})}$ | (Cenco-Fitch) | 1.3 |
| Specific Heat at 77 F $\frac{\text{Btu}}{(\text{lb})\ (\text{F})}$ | — | 0.35 |
| Flammability | | |
| Burning Rate | D635-44 | 0.6 in./min |

The ingenious plant engineer who takes a fresh look at his domain with the properties of acrylic plastic in mind can doubtless solve many persistent problems in addition to those mentioned. It's a material that invites, and often rewards, experimentation. It can be purchased from dealers in every sizable community, who can be located by consulting the "Plastics" heading in the classified section of the telephone directory.



LIVE BETTER ELECTRICALLY

# How Pepperell saves $15,000 a year with capacitors

**"Reduced line losses, increased system capacity, improved voltage conditions and an estimated $15,000 a year savings in our electric power costs are the benefits we've gotten from installing General Electric industrial capacitors,"** says Mr. Comer Turley, Mechanical Superintendent at the Pepperell Manufacturing Company of Lindale, Georgia.

Like most manufacturing plants, Pepperell, maker of denim goods, has a power factor clause in its electric utility contract. This means that the higher its power factor, the lower its power costs. Since the firm started with a power factor of 74% and is now running at approximately 98% power factor, dollar savings, from power-cost cuts alone, amounted to $4481 for the first four months of this year.

Total estimated savings for a year will be easily $15,000. This means that Pepperell will pay off its capacitor investment with dollars saved from its power costs in about two years—and then continue its savings as sheer profit for some years to come. **Can you afford to overlook savings like this in your plant?** If you use induction motors, check your power factor—or ask your G-E sales engineer to do it for you. Then check your utility power contract and see how much you will save by raising your power factor. You and your sales engineer will be able to determine *in advance* how much you will receive in dividends on your investment in General Electric capacitors. For more information, write for Bulletin GEA-5632, "How To Use Capacitors." General Electric Co., Section 441-113, Schenectady 5, N. Y.

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

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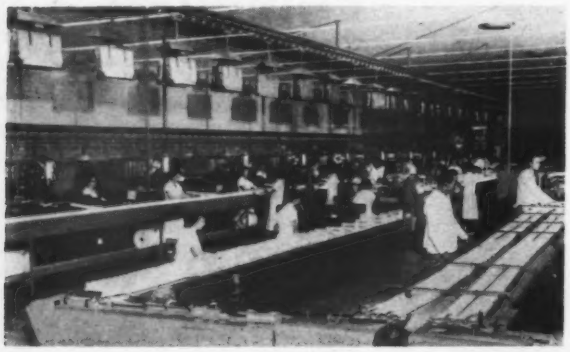
## Cigarette Plant Goes Automatic To Achieve Millions-A-Day Production

HIGHLY AUTOMATIZED, expandable, and the only major single-level cigarette plant in the United States, the new $13,000,000 P. Lorillard Company plant in Greensboro, N. C., incorporates many procedures completely new to the cigarette industry.

Specially-designed automatic production processes and controls; a seven-laboratory research center for product quality control and basic tobacco research; and automatic plant-wide climate control and air conditioning are among the features of the plant.



Now in production, the plant—with its 13 acres of floor space—will be able to produce at peak capacity more than 100 million cigarettes in a single shift. This amounts to 250 billion in a 250-day working year.

From the time the hogsheads of tobacco move on automatic conveyors into the processing area, until the finished cigarettes roll out of a making machine at a rate of 1200 per minute, there is no need for a human hand to touch the tobacco.

Among the special equipment designed by Lorillard or to its specifications are unique automatic feeder-conveyors which move the processed tobacco in a steady flow above the making machines, feed it into those machines and automatically maintain the precise level of tobacco in the hoppers.

A unique flow and weight control system guarantees a perfect and uniform proportioning of three basic types of tobacco. As each of these types flows on conveyors toward the blending hoppers, scales weigh each "in flight" and automatically control the precise amount of each type. These same scales also total the amounts, for daily inventory control.

## Bearings and Their Lubrication To Be Studied in New Center

LARGEST TEST and development facility of its kind in American industry, a $1 million bearing and lubricant center has been opened by the General Electric Co. at Schenectady, N. Y. The new center is equipped to carry on advanced development work relating to atomic submarines, jet engines, missiles and satellites, as well as improvements in turbines, motors and household appliances.

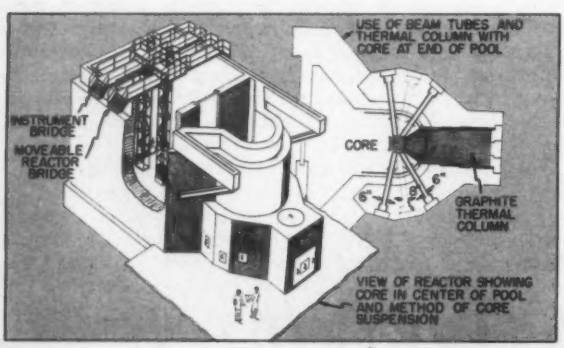
Some of the revolutionary concepts that will be studied at the center are air bearings, which greatly minimize or eliminate friction, and the use of molten metals and molten glass as supersonic lubricants.

Formerly divided into separate facilities in Lynn, Mass., and Schenectady, the new center combines the company's bearings and lubricants development facilities. It has a staff of 30, including 14 engineers.

## Country's First Privately Owned Nuclear Research Center Starts Operations

COMPLETION OF THE NATION'S first privately owned Nuclear Research Center was recently announced at Battelle Institute, Columbus, Ohio, at the initial "start-up" of the Institute's one-million-watt research reactor.

The $750,000 reactor is the largest of the pool type yet to be put in service in this country, and is designed exclusively for research. It uses solid uranium-235 fuel. The core, composed of fuel elements and boron control rods, is suspended 22 ft below the surface in a large pool of highly purified water. The water serves as a coolant and as a shield to protect personnel from radiation. The reactor was designed by Battelle physicists and engineered and built by the American Machine and Foundry Co.

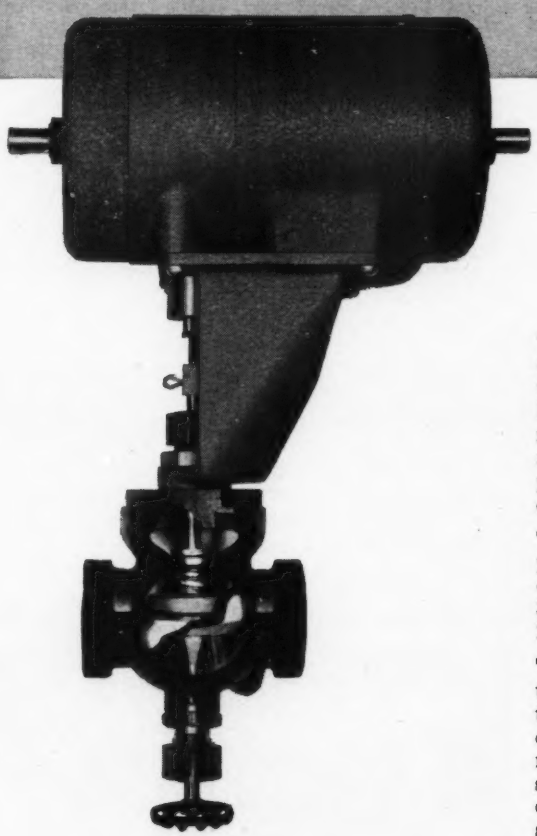

USE OF BEAM TUBES AND THERMAL COLUMN WITH CORE AT END OF POOL
INSTRUMENT BRIDGE
MOVEABLE REACTOR BRIDGE
CORE
6'
6'
GRAPHITE THERMAL COLUMN
VIEW OF REACTOR SHOWING CORE IN CENTER OF POOL AND METHOD OF CORE SUSPENSION

Basically, the reactor is a nuclear apparatus for producing gamma rays and nuclear particles called neutrons. The reactor will be used in research on the chemistry of petroleum, sterilization of pharmaceutical products, preservation of agricultural goods and improvement and development of chemical, glass, plastic, ceramic and metallic products and processes.

In addition to the radiation (hot cell) laboratory, the reactor development (critical assembly) laboratory, and the research reactor, Battelle has ore treatment and chemical engineering laboratories (for the recovery of fissionable materials), a reactor materials laboratory, and radiochemical facilities.

# NEW ACTIONATOR*

## heavy duty electric motor for operating valves, dampers, louvers



The new Honeywell ACTIONATOR is a compact, lightweight, rugged and flexible industrial motor for operating valves, dampers, louvers, and other final control elements. Models are available for mounting on, and operating rotary valves or dampers. The ACTIONATOR is also available with cam operator and yoke. Internal strain release protects valve seats and gear train so that it can be used on practically any slip stem valve.

The ACTIONATOR is a reversing capacitor type motor and provides on-off, two-position, floating or proportional control. Shaft rotation can cover up to 180 degrees in 7½, 30, 60, or 120 second timings; torque ratings from 50 to 200 inch-pounds depending on motor speed.

The proportional control model provides slidewire resistances of 100, 135 or 1000 ohms, and can be used with any type of electric proportional controller. A second slidewire can be used for retransmission . . . to operate another motor, or for remote indication. Spst and spdt auxiliary switches can also be installed within the end bells. The enclosed terminal compartment is designed to meet J.I.C. standards.

Limit and auxiliary switches, specially designed by MICRO SWITCH, allow the ACTIONATOR to be used where ambient temperatures range from −20 to +150 F.

For complete information and specifications on the new ACTIONATOR, call the nearest Honeywell office, or write (send coupon) to:

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Phila. 44, Pa.

*Industrial Division*
MINNEAPOLIS-HONEYWELL REGULATOR CO.
Wayne and Windrim Avenues, Philadelphia 44, Pa.

☐ Please send me additional information on the ACTIONATOR.

☐ I'd like a Honeywell sales engineer to discuss applications of the ACTIONATOR in my plant.

Name_____

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MINNEAPOLIS Honeywell

*First in Controls*

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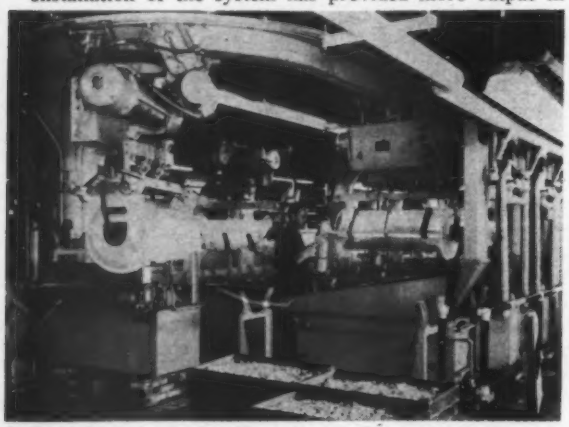
## Automatic Duty Cycle Hoist System Helps To Automate Plating Operation

A SYSTEM of automatic duty cycle hoists which combine to form a flexible continuous processing system, is in operation at the Gillette Safety Razor Co. of Boston, Mass. Engineers of the company worked with hoist engineers of the Yale & Towne Manufacturing Co. to design the processing cycle for plating small razor parts.

The razor manufacturer wanted a system which was faster, more compact and more flexible than the old rack plating process and one in which manual handling and lifting was kept at an absolute minimum.

Solution to the requirements was found in arranging the processing and plating tanks in a long, oval pattern and handling the parts with six Yale electric hoists with motor driven trolleys mounted on a closed loop track above the tanks.

Installation of the system has provided more output in less space with less manpower than a conveyorized rack plating system and has the further advantage of permitting changes in cycle length for any or all segments of the process by the simple adjustment of control circuits and



Only manual handling operations in the system are at the beginning, when trays of parts are dumped from trays into large perforated, plastic barrels suspended from the hoists by special non-conductive load bars, and at the end when the barrels are dumped into a hopper which in turn automatically dumps them into a dryer. From the dryer the parts are returned to their original trays ready for inspection and assembly.

The plating operation is divided into four phases, three of which consist of several operations.

In the first phase the actions of the hoist, raising and lowering the load and travel from tank to tank, are controlled by the operator from the hoist pendant push button control station. When he lowers a load into a tank the lower limit switch actuates a remote timer which is preset to any desired time from three seconds to 20 minutes.

Following completion of the processing in the last tank of phase one, the load is ready to be cycled through the next series of tanks automatically.

When the plating is completed, indicated again by a light (one for each of the 12 stations) and a bell, the operator moves a hoist over to the tank, picks up the barrel and sets the "automatic" button on the push button station. This starts the parts through a final automatic cycle consisting of seven tanks, each of which requires a different immersion time. At the end of this automatic sequence a final signal tells the operator the parts are ready to be moved to the unloading station and dumped into the hopper which will transfer them to the dryer.

## Sound Laboratory for Testing Fluorescent Lamp Ballasts Achieves Low Noise Threshold

SOUND RATING and testing of fluorescent lamp ballasts and development of new designs and techniques for making quieter ballasts, are two of the uses of a new sound measurement laboratory at General Electric Company's Ballast Dept. in Danville, Ill.

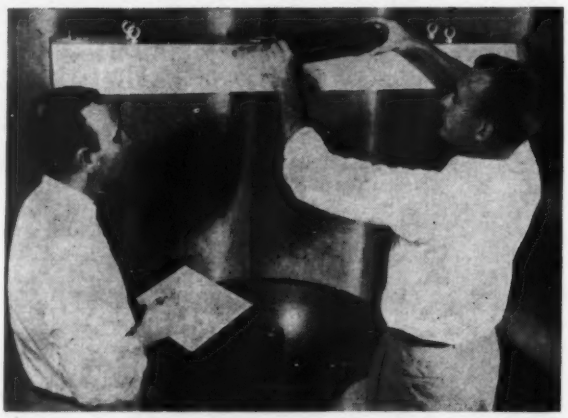
Consisting basically of a room isolated within an outer room, the new laboratory includes unusual construction and design features necessary to achieve a noise level considerably below the threshold of hearing.

Walls of the inner room are of six-inch concrete slabs tilted on end and held together by concrete pilasters and reinforcing rods. Ceiling and floor of the inner room are six-inch poured concrete slabs. The entire room which weighs approximately 100,000 pounds, is supported on springs which in turn rest on a pad of cork and rubber layers.

The outer room, completely enclosing the inner room, has eight-inch concrete block walls, filled with concrete, and an eight-inch poured concrete ceiling.

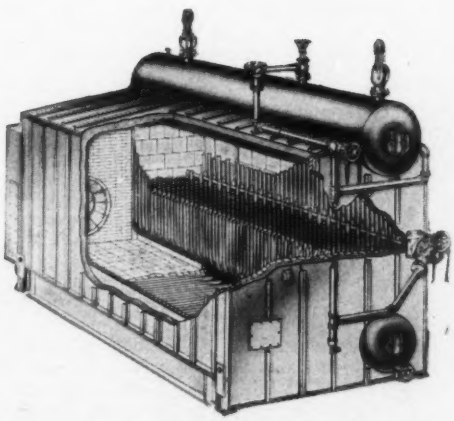
Water, sewer, and steam lines could not be brought into the laboratory because of possible sound conduction through these paths. Heat is provided by electric heaters between inner and outer walls, and cooling by a vestibule air conditioner. Power had to be brought into the building by underground cable, since overhead lines might have induced vibration into the building.

In ballast testing and sound rating, the ballast is mounted



on a dummy fixture in the center of the inner room, and the doors to the room are sealed. By remote control, the fixture is turned on, and any sound from it is picked up by a collecting horn and microphone. The sound is then amplified and calibrated on instruments in the outer room. A calibration standard for sound level meters allows corrections to be made to compensate for changes in the meters, so that readings will be consistent over a period of time.

# field report on the flexibility and overload capacity of a Foster Wheeler 45,000 lb/hr PACKAGED STEAM GENERATOR



Cutaway drawing of FW Packaged Steam Generator of the type shown installed above at a large New England chemical plant. Except for the firing front, the entire unit is located out of doors. The performance tests mentioned here were made in December, under typical New England weather conditions.

FOSTER WHEELER engineers have conducted extensive performance tests on a 45,000 lb/hr oil-fired Packaged Steam Generator installed at a large New England chemical plant.

During a 30-day period, the unit was operated at 42,500 lb/hr on a 24-hour basis, delivering over 1,000,000 lb of steam per day. It was also operated at 46,500 lb/hr over an 8 hr period.

Efficiency at design load of 45,000 lb/hr exceeded contract requirements of 83.2%. During performance tests the boiler was operated in excess of 51,000 lb/hr at an efficiency of 82%.

Although purchased as a base load unit, tests were also conducted to determine its flexibility. Rapid load swings from 10,000 to 51,000 lb/hr were set up while on automatic control. The boiler was able to swing from one extreme to the other in considerably less than 60 seconds.

This very satisfactory performance stems from the conservative FW design and generous water storage capacity which are important features of the entire standard line. Available in rated capacities from 10,000 to 50,000 lb/hr, with wide choice of burners and controls. For complete information, send for Bulletin No. PG-55-3. *Foster Wheeler Corporation, 165 Broadway, New York 6, N.Y.*

**FOSTER FW WHEELER**

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

**For more facts circle 567 on Reply Card**

# NEW PLANT CONSTRUCTION — advance information on location, costs

**Tuscaloosa, Ala.**—Reichhold Chemicals Co., Inc., 523 N. Broadway, White Plains, N. Y., is constructing a new plant at existing facilities here, for the production of formaldehyde. New plant will have a production capacity in excess of 35 million pounds per year and is expected to be in operation by late 1957.

**Silt, Colo.**—J & J Rogers Co., Ausable Falls, New York, has announced plans for the construction of a new newsprint mill. Plant reported to cost in excess of $10 million before scheduled operation in early 1958. Mill will be equipped to produce other grades of paper as the market warrants.

**Stratford, Conn.**—Sikorsky Aircraft Division, United Aircraft Corp., South Avenue, Bridgeport, Conn., manufacturers of helicopters, has announced a major expansion of company facilities here. New plant will have a floor area of 433,200 sq ft. Work is expected to get under way at once for completion in late 1957. Project is reported to be a multi-million dollar investment.

**Pensacola, Fla.**—American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y., has announced plans for the construction of new plant. Company engineers will design and supervise construction of the plant. Plant is scheduled to be in operation by mid-1958 and will represent a multi-million dollar investment.

**Pensacola, Fla.**—Chemstrand Corp., Decatur, Ala., has announced plans for the further expansion of company facilities for the manufacture of nylon. Present full capacity of the plant now running at 58 million lb annually, will be increased to 88 million lb in November 1957 and to 100 million lb in January 1958.

**St. Petersburg, Fla.** — Air Associates Inc., 60 Industrial Ave., Teterboro, N. J., aviation products and electronic equipment, plans to construct a new plant for the manufacture of company products. New facility will occupy 200,000 sq ft when completed. Company plans to move entire plant operations to new facility when completed in 1957. Plant is reported to cost in excess of $2 million.

**Atlanta, Ga.**—Armco Drainage & Metal Products, Inc., 1939 Armco Ave., Middletown, O., has authorized plans and work is already under way on new plant for steel fabrication. New plant will produce gasoline and fuel oil tanks for bulk storage, corrugated metal pipe and pipe-arch in a wide range of sizes, farm pond drainage pipe and miscellaneous construction products. New facility to cost an estimated half million dollars will replace company operation at East Point, Ga., when placed in operation in mid-1957.

**Columbus, Ga.**—Nehi Corp. has announced plans for the construction of a new mechanized bottling plant for the Royal Crown Cola—Nehi Bottling Co. on local site here. This one-story structure, for production of company's soft drinks, will be in operation by mid-1957 and is reported to cost about $750,000.

**Tuscola, Ill.**—National Petro-Chemicals Corp., subsidiary of National Distillers Products Corp., 99 Park Ave., New York, N. Y., has plans under way to increase production of polyethylene plastic. New expansion facilities and equipment will approximate an expenditure of $10 million.

**Noblesville, Ind.**—Firestone Tire & Rubber Co., 1200 Firestone Parkway, Akron, O., plans to construct a new plant for the production of rubber air springs for automobiles. Construction of the new unit will get under way at once and is scheduled to be in partial production by late 1957.

**Ferndale, Mich.**—Republic Steel Corp., Steel & Tubes Division, has authorized plans for the expansion of company facilities at local plant here. Plans call for space and equipment for the manufacture of light wall conduit tubing. Work will begin at once for completion late in 1957. Cost of buildings and equipment to be about $3 million.

**Savage, Minn.**—Green Giant Co., Le Seur, Minn., plans to construct a new vegetable canning manufacturing plant on local site just north of Route 101. Company has canning operations in various cities throughout the country and is a subsidiary of the Rock Valley Canning Co. New facility will cost an estimated $1 million when completed in 1957.

**Missoula, Montana**—Waldorf Paper Products Co., 2250 Wabash Ave., St. Paul, Minn., plans to erect a new pulp mill near here. Facility will have an initial capacity of 250-tons of pulp daily and will supply unbleached pulp for company's box board and other paper manufacturing operations. Construction is planned to begin soon with production scheduled for early 1958. Plant to cost in excess of $6 million.

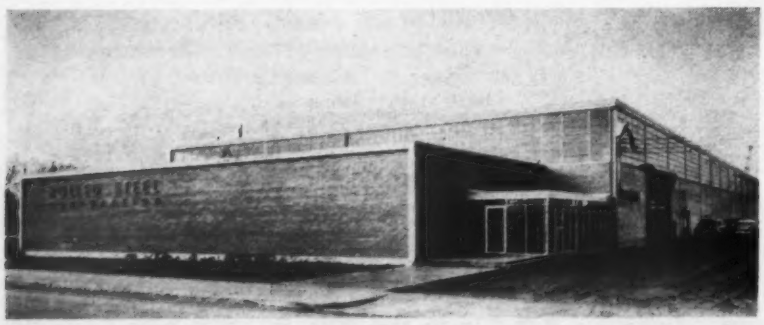
**Haddonfield, N. J.**—Hussman Refrigerator Co., 2401 N. Leffingwell Ave., St. Louis, Mo., has authorized construction of a one story concrete manufacturing plant. Building will be 280 ft wide and 440 ft long, with a floor area in excess of 102,000 sq ft. The Costanza Contracting Co. has been awarded the construction contract and work will begin soon. Building, with land and equipment, will represent an investment of 5 million.

**Bound Brook, N. J.**—Bakelite Co., a division of the Union Carbide & Carbon Corp., 30 E. 42nd Street, New York, N. Y., has authorized further expansion of its plastics research and development center here. Four additional buildings are planned at a cost of $1 million, to bring to seven the number of building units at the plant. Completion is scheduled for fall, 1957.

**Camden, N. J.**—Campbell Soup Co., 100 Market St., has recently announced a major expansion program of company facilities throughout the country. Expansion plans include rehabilitation of company's main plant here and construction of new plants at Napoleon, O. and in California, all to be completed in the fiscal year of 1957. A new general office building now under construction is expected to be ready for occupancy by summer of 1957. Company has approved an expansion budget of more than $27 million for increased sales.

**Fords, N. J.**—Catalin Corp. of America, 1 Park Ave., New York, N. Y., plans to construct new laboratory

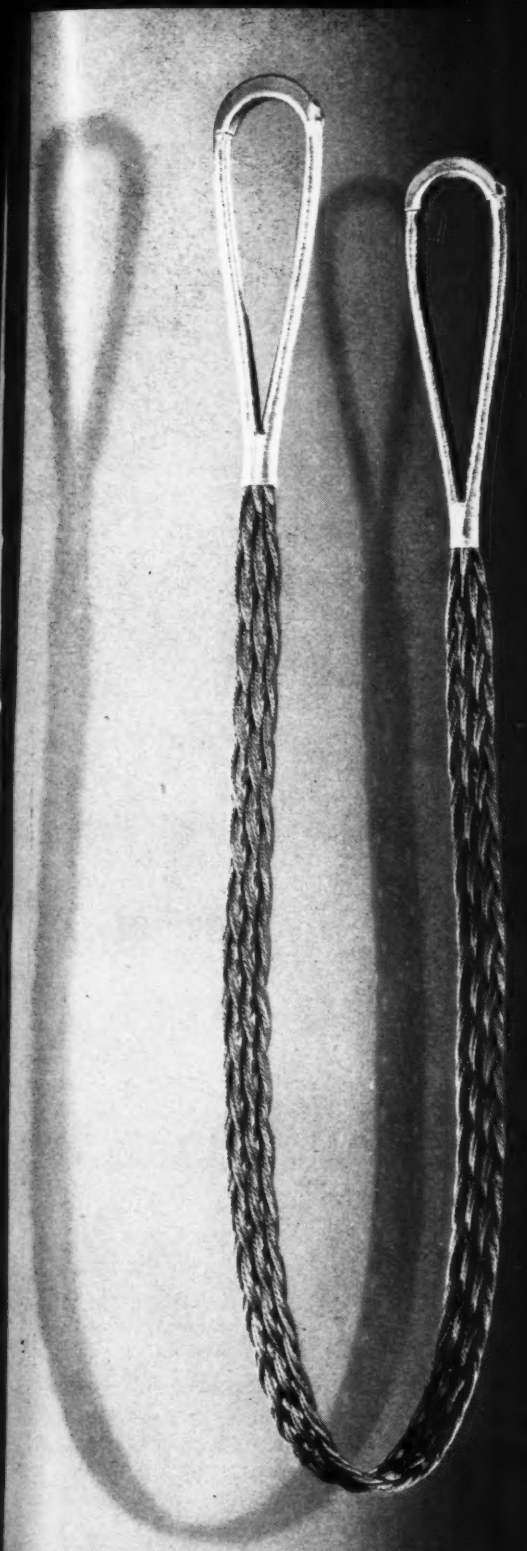
(Continued on page 214)



**The tri-level principle so popular in residential construction has been employed in this industrial plant of the Rolled Steel Corp. in Skokie, Illinois. Sales office and plant area are at ground level. Five feet above this level are the executive offices. The clerical staff is a half flight below the sales office and plant level**



For more facts circle 568 on Reply Card ——→



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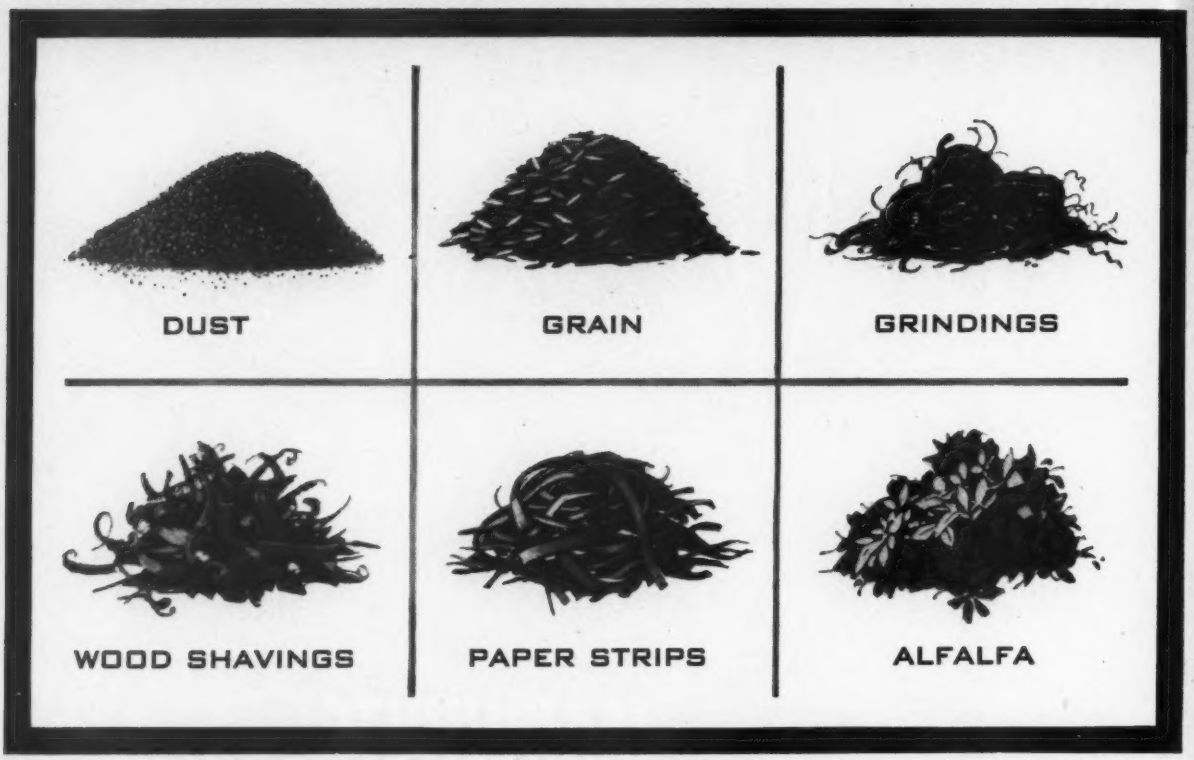
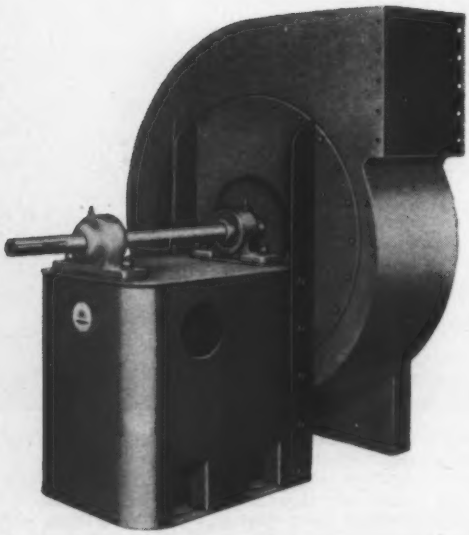



# American Blower Industrial Fans take large or small particles right in stride!



Lick tough process applications with the versatile American Blower Industrial Fan.

**The secret is their versatility.** You see, the American Blower Industrial Fan is available with three types of wheels: Type AH for air handling, Type MH for material handling, Type LS for long shavings.

And there's a wide range of fan arrangements, optional constructions—for severe duties or high-temperature operation—and optional accessories to allow fan modification to suit an individual job.

What's more, it's available as a packaged fan—that is, a self-contained unit with its own motor, drive and weather-proof hood enclosure. This eliminates the need for a separate motor foundation, and the complications of motor lineup, belt centers and weather protection.

If you have a process application involving air, gas, or material handling, why not consider our industrial fan? Your nearest American Blower branch-office man is the one to call. His intimate knowledge of the special problems of many industries—and his complete product line—is at your disposal.

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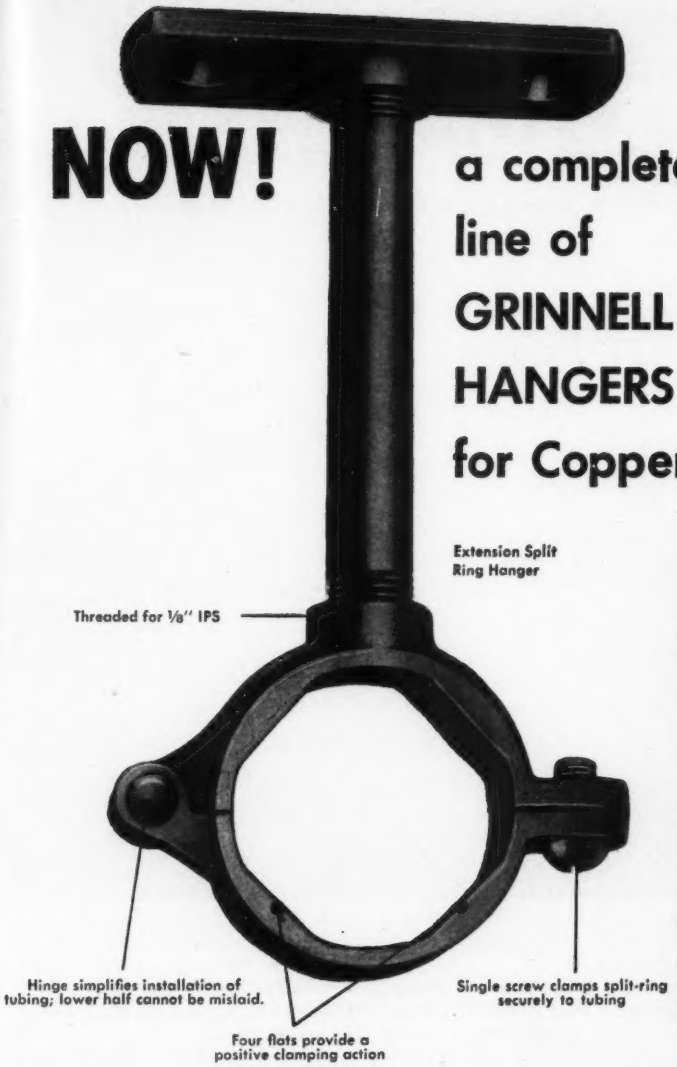
# NOW! a complete line of GRINNELL HANGERS for Copper Tubing

Adj. Wrought Clevis Hanger with Threaded Rod and C-Clamp


Extension Split Ring Hanger
Threaded for ⅛" IPS
Hinge simplifies installation of tubing; lower half cannot be mislaid.
Four flats provide a positive clamping action
Single screw clamps split-ring securely to tubing

Adj. Wrought Ring Hanger

Split-Ring with Socket and Coach Screw

Adj. Wrought Band Hanger

Grinnell now offers, in one *complete* line, every standard type of hanger and support for copper tubing. All are heavily copper plated for long, rugged wear. All are accurately sized to fit standard copper tubing, and designed to give a neater installation wherever copper tubing is used.

For dependability, speed, and convenience . . . let Grinnell's coast-to-coast network of warehouses and jobbers serve you as a one-stop source for all your copper tubing hanger requirements. Grinnell-trained personnel are ready to work with you "on-the-job", anywhere, to help solve any problem connected with hangers and supports for copper tubing.

Whether it be for copper tubing or standard pipe, specify Grinnell hangers. No other company makes as complete a line; provides as thorough a distribution service; or can cooperate as fully on *all* your piping assignments.

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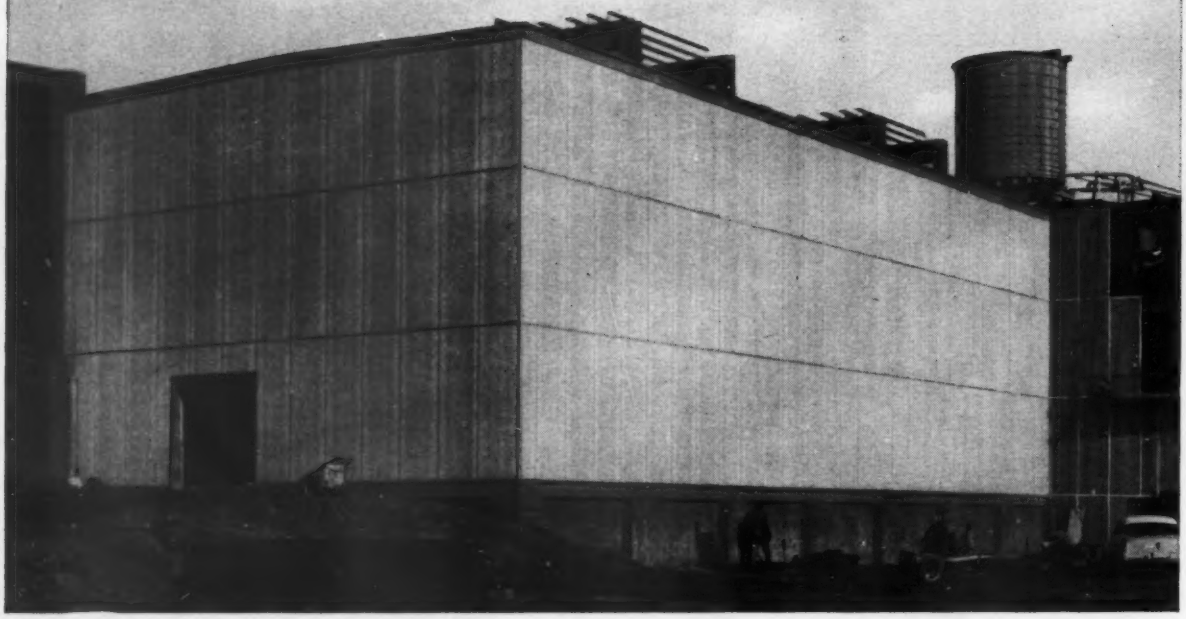
# Maximum coverage...minimum erection cost...

## Johns-Manville TRANSITOP® Structural Panels

### Meet the trend to modern panelized construction



THE most striking change in building construction methods in recent years has been the trend toward prefabricated building panels.

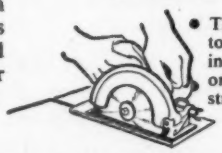
This is particularly true in the construction of panelized curtain walls for buildings, large and small. Although curtain wall construction in skyscrapers had been widely publicized, this method of construction is just as applicable to smaller buildings such as schools, hospitals, office buildings, motels and shopping centers. Today, paneled curtain walls probably exceed all other applications in popularity and are rapidly becoming the standard method of building construction.

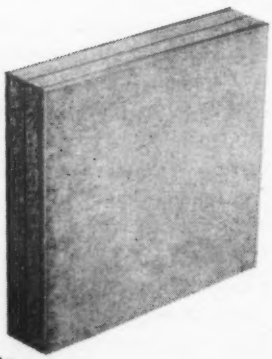
Johns-Manville Transitop offers architects, designers and builders a simple and economical method of providing panelized curtain walls. Transitop is durable, weather resistant, requires minimum maintenance. As a curtain wall, Transitop provides high structural strength, reduces the dead load, increases usable floor space, provides adequate insulation and is easy to erect. Panels are easily applied over wood or steel framing.

The same advantages that make Transitop so suitable for panelized curtain wall construction also make it equally ideal for roof deck construction.

J-M Transitop is a complete 4′ wide by 8′, 9′, 10′ or 12′ long unit in 11/16″, 1 1/8″, 1 9/16″, or 2″ thicknesses. It consists of an integral impregnated insulating board core faced on two sides with Asbestos Flexboard® sheets.

- Facings of tough, weatherproof asbestos-cement Flexboard
- Core of integrally impregnated insulating board
- Waterproof adhesive bonds core to Flexboard sheets
- Transitop is cut to fit and installed with ordinary construction tools





JOHNS-MANVILLE JM PRODUCTS

**For information on Transitop, write Johns-Manville, Dept. PE, Box 158, New York 16, N. Y.**

# Johns-Manville Transitop

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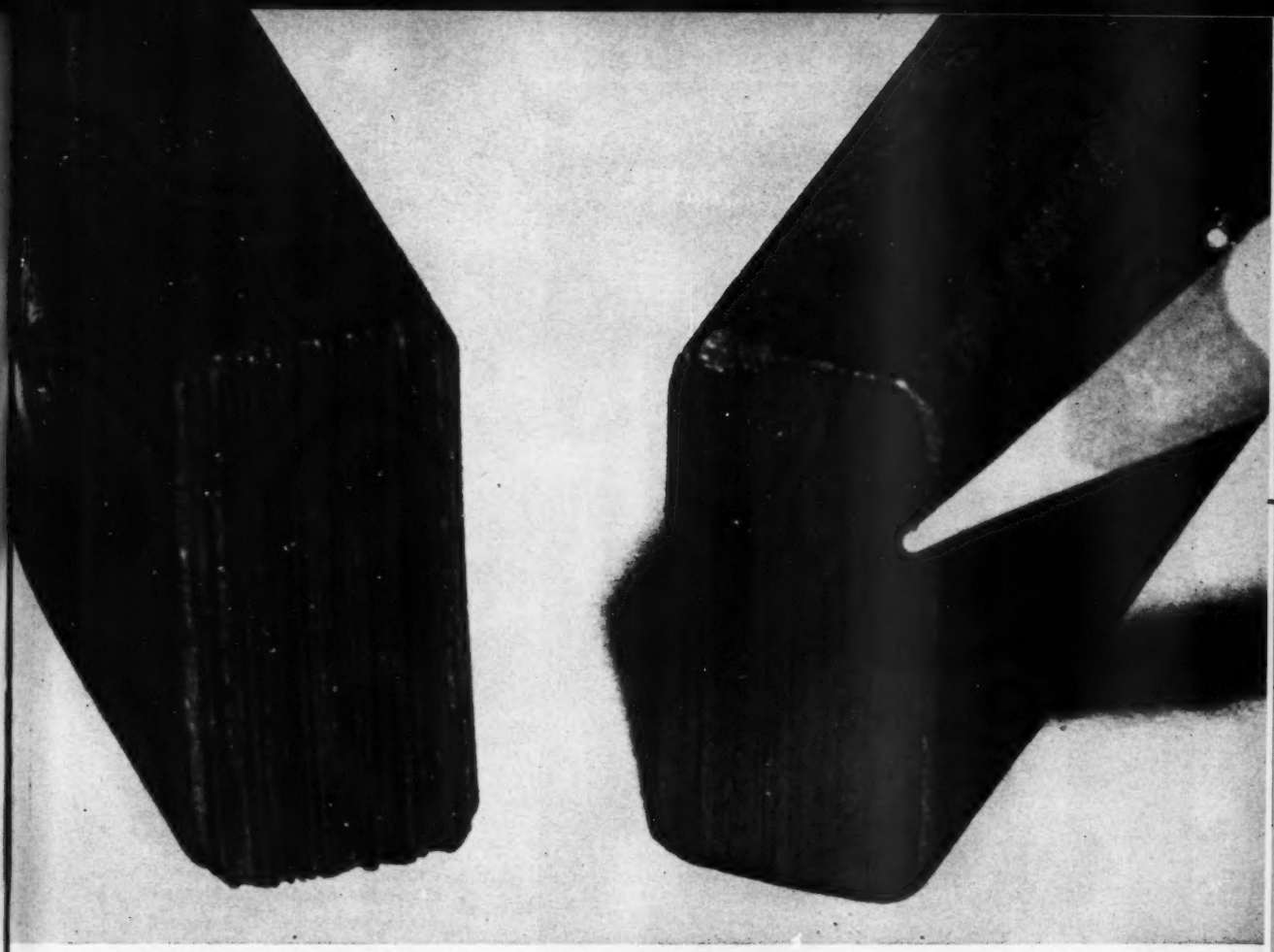

**Wrong brush:** This magnified view shows threading on brush after approximately 1000 hours of operation in nitrogen on a totally enclosed synchronous motor.

**Right brush:** After 1000 hours on the same motor this specially developed General Electric carbon brush has suffered comparatively little wear.

# Even a nitrogen bath didn't faze the right General Electric carbon brush

The threaded carbon brush at left above had just spent 1000 hours operating on a totally enclosed synchronous motor filled with pure nitrogen. Such a brush surface indicates excess wear on the collector ring and results in increased maintenance and lost production time.

**The solution?** A General Electric carbon brush, developed for operation in nitrogen atmospheres. The brush at the right above shows little wear after 1000 hours of operation, giving assurance of continued satisfactory service.

**Of course, not all brush problems** are this easy to solve. But one way you can help avoid trouble is to specify General Electric carbon brushes which have been specifically designed and tested for your G-E motors and generators. A complete line for any G-E motor or generator over one horsepower is available. For more information contact your nearest General Electric Apparatus Sales Office or General Electric Distributor. Write for Bulletin GEA-5597. General Electric Company, Section 774-3, Schenectady 5, New York.

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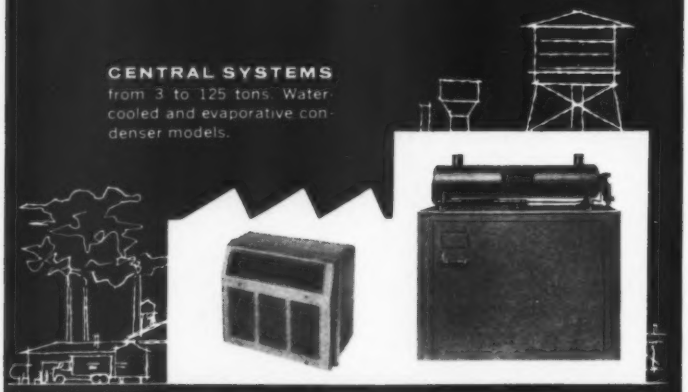

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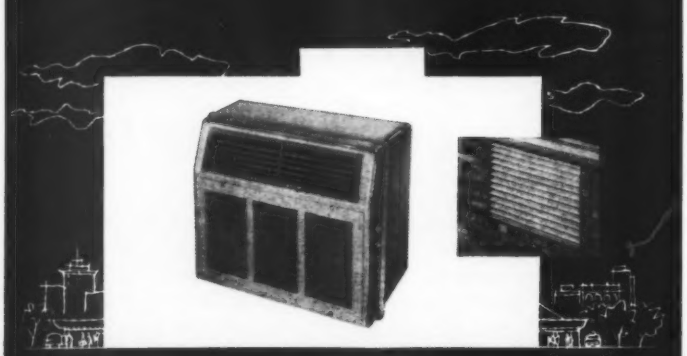

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**2** ***Chrysler Engineered!*** Airtemp cooling systems are engineered by Chrysler, famous for performance and reliability. You can rely on efficient, flexible cooling . . . low-cost, trouble-free operation.

**3** ***Installation Help!*** Airtemp Construction Division will be glad to recommend a reliable local engineer and contractor . . . and plan your installation with them.

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Keep moving parts of machines and other large equipment running smoothly . . . flexible, straight or angle spouts.

**#33 ALL-PURPOSE PUMP OILERS**

Dependable, reasonably-priced . . . for many lubrication needs in factory, machine shop, warehouse . . . also available with flexible spouts.

**SAFETY CANS**

approved by Underwriters' Laboratories, Inc. and Factory Mutual . . . safe for handling of flammable liquids . . . trigger or free-swing handle type.

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*The Complete Line*

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*Order* EAGLE cans and oilers from your supplier or write direct to Eagle for information.

**WELDED STEEL SUPPLY CANS**

Storage and filling cans for railroads, mills, factories, mines, foundries.

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For heavy factory use . . . flexible or straight spouts . . . optional seal tip prevents leaking.

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Handy for all tool kits . . . for oiling meters, gauges, and many other factory uses.

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*says CLIFFORD F. HOOD, President, United States Steel Corporation*

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*Trambeam flexibility is a great advantage in handling materials outside the plant as well as inside. A sign company, for example, moves their products via Trambeam from raw steel through fabrication onto shipping dock as shown above.*

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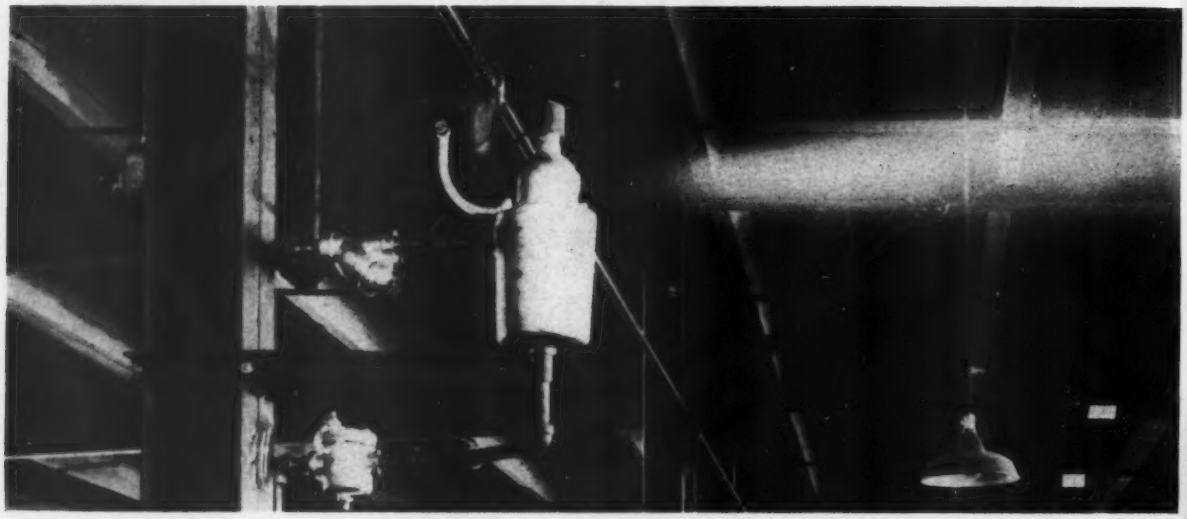
# When You Want to Humidify—



## Consider the Advantages of ARMSTRONG *Steam* Humidifiers —Easy to Install and Maintain . . . Automatic, Accurate Control

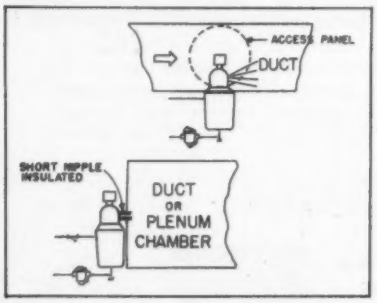
Whether you want to humidify an office for the health and comfort of employees, a rubber cement plant to prevent the hazards of static electricity, or a church to protect the pipe organ...Armstrong can help you do it better—and at less overall cost—with steam humidifiers.

They discharge steam directly into the room or into ducts or plenum chambers—either way you get large capacity at low cost. For explosive atmospheres, there are air-operated models. What's more, there's no mineral "dust" to settle onto employees and equipment.

Control is really accurate—relative humidity is held within 2 to 4% of setting. The steam disperses quickly and the sensitive humidistat responds quickly to slight changes in humidity.

Maintenance is almost a forgotten word with these units. There's nothing to clog the valve or scale up the inside. Solenoid coils are glass wound. Valves and humidistats last indefinitely; fan motor bearings are lubricated for life.

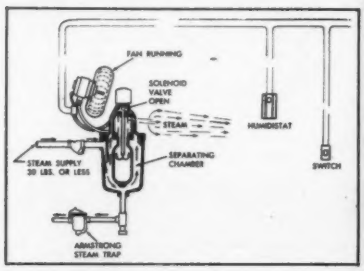
There are other advantages, too. No damp spots—the unit has a steam jacketed inner chamber which evaporates condensation; the steam carries no water droplets. Effect on air temperature is negligible. No odor—pure steam is odorless. Quiet operation — unit is acoustically designed.




**BULLETIN No. 500**
**gives complete information. Tells:**

- How relative humidity affects profits, health, comfort and safety.
- Why steam is best for humidification.
- How users of Armstrong Steam Humidifiers profit.
- How to select and install units.
- Complete physical data and prices.

Send for your free copy today! Call your local Armstrong Representative, or write:




**HOW THEY WORK**

When humidistat calls for moisture, solenoid steam valve opens and fan starts. Steam enters separating silencing chamber, then goes to atmosphere. When humidity reaches desired level, valve closes and fan stops.

**NEW!**

Automatic, controlled evaporative-type central humidifier

**. . . the HUMID-I-MAKER**

Air is blown across surface of heated water and into central duct. No mineral dust. High capacity. For use with hot water, steam and warm air heating systems — in homes, offices, greenhouses, schools, etc.

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## One of America's largest and leading dairy associations uses

# 69 CLEAVER-BROOKS BOILERS

SEE OUR EXHIBIT
BOOTH NOS. 648-650
INTERNATIONAL HEATING & AIR CONDITIONING EXPOSITION
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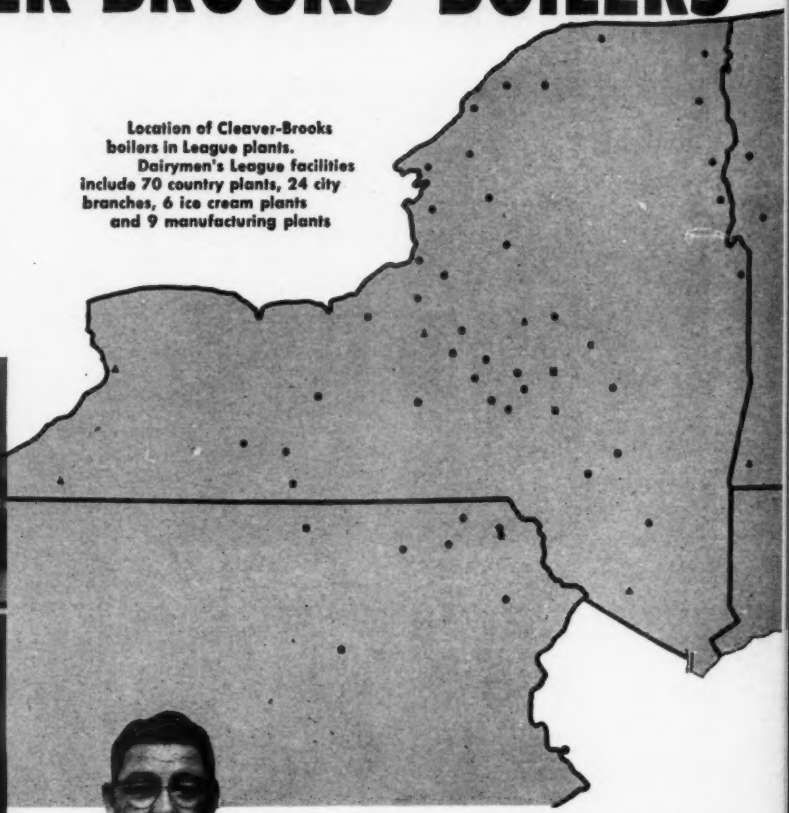
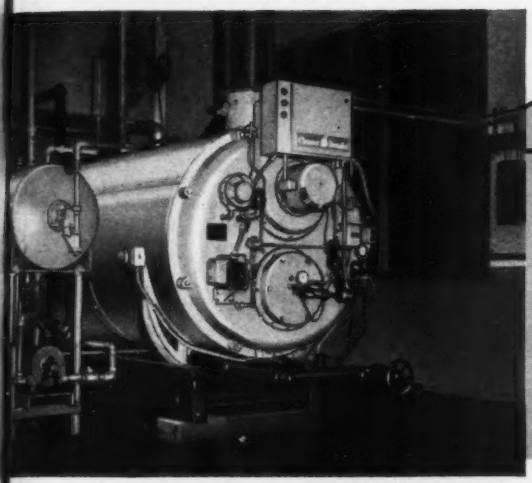


Location of Cleaver-Brooks boilers in League plants. Dairymen's League facilities include 70 country plants, 24 city branches, 6 ice cream plants and 9 manufacturing plants



**MILTON, PA.** — This country plant is supplied with quick, dry steam from a Cleaver-Brooks 60 hp light-oil fired CB boiler.

"Our 69 Cleaver-Brooks boilers are a key part of our production — their unusually high efficiency, sanitary, clean operation have helped us grow and prosper", says Ken Dodge, staff engineer for Dairymen's League Cooperative Association.

"Maintenance is low. We average far less than one service call per boiler per year," he adds.

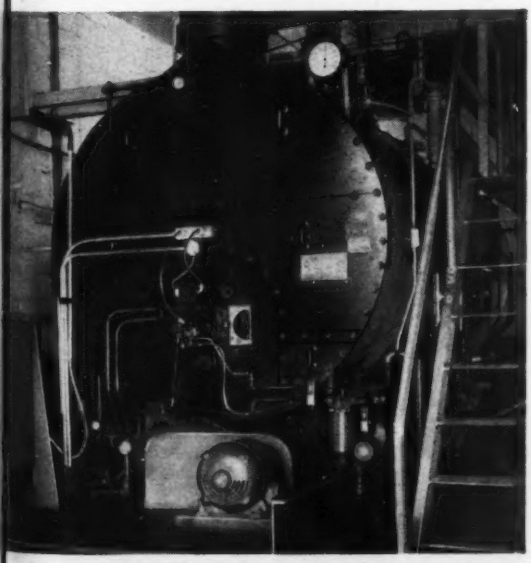
Dairymen's League Cooperative Association, serving 25,000 dairy farmers and thousands of consumers in New York, Pennsylvania and New Jersey, has been a steady user of Cleaver-Brooks boilers for 20 years.

Like any dairy company, the League finds steam essential for the production of quality dairy products. Their boilers are the work horses of their plants — supplying steam for pasteurizing, heating, cleaning and processing.

And Cleaver-Brooks boilers, with their exclusive four-pass, forced draft design and clean, quiet operation are especially suited to dairy plant operation.

Famous dairies the country over are profiting with the many advantages of Cleaver-Brooks boilers, available in a complete line. You can select from 110 models in 18 boiler sizes, 15 through 600 hp . . . oil, gas and combination oil and gas fired.

For more information contact your nearby Cleaver-Brooks representative. Or write Cleaver-Brooks Company, Dept. A 364 E. Keefe Avenue, Milwaukee 12, Wis. Cable Address: CLEBRO — Milwaukee — all codes.



**UTICA, N.Y.** — In this city plant a 250 hp LR heavy-oil fired boiler provides all steam for pasteurizing, cleaning, heating and processing.

**Cleaver Brooks**

ORIGINATORS OF THE SELF-CONTAINED BOILER

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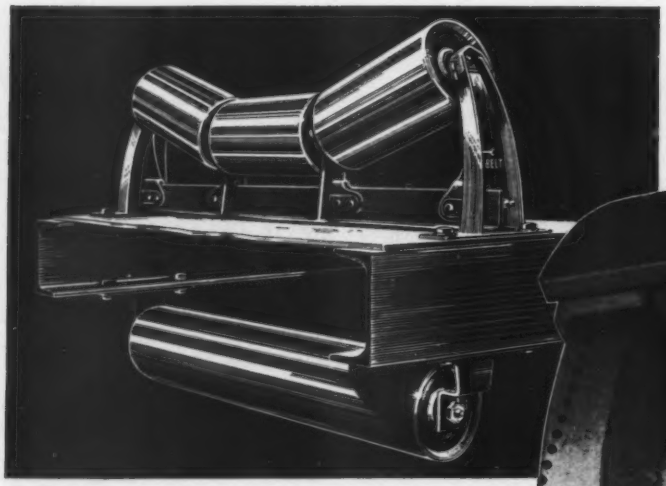
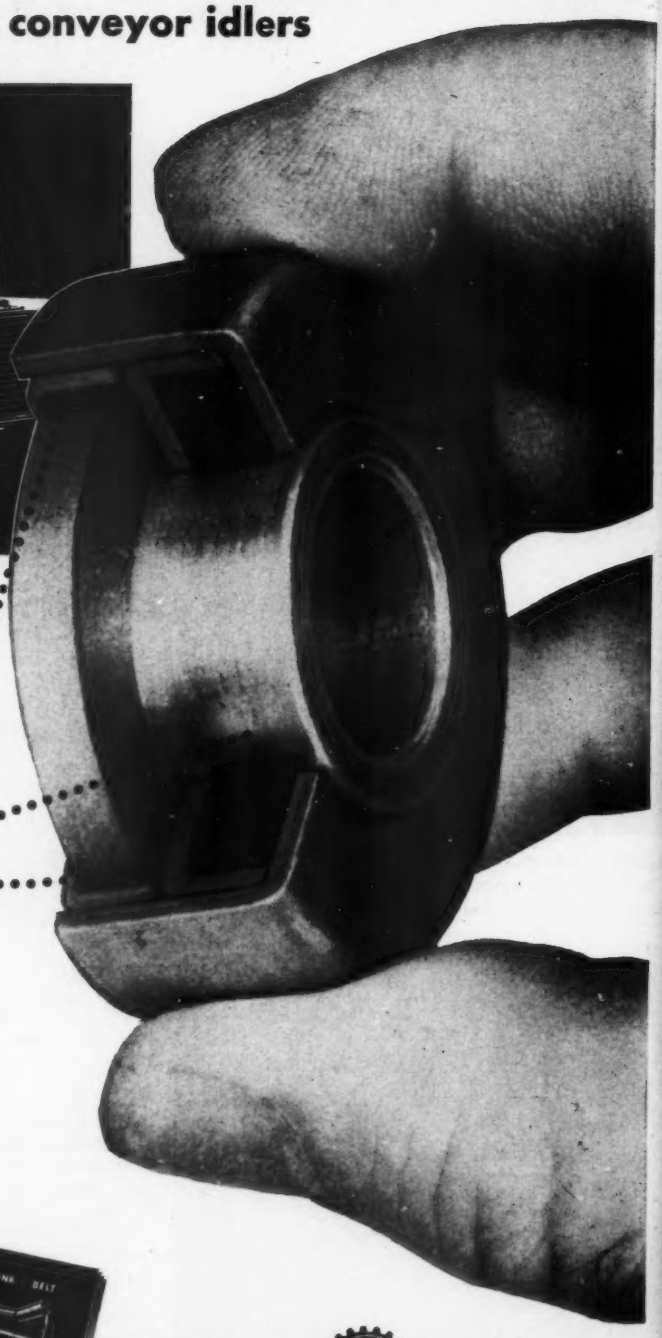
# TRIPLE DIRT DEFENSE

## ...yours in LINK-BELT belt conveyor idlers





## this grease seal is 3 seals in 1

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- **Contact seal**
- **Grease-filled clearances**

This compact, one-piece cartridge — a Link-Belt exclusive — is industry's simplest and most effective seal. Its three-way protection holds grease in, keeps dirt out for long bearing life. What's more, inspection and maintenance are simplified. No springs, clips and other small parts to lose . . . no metal-to-metal contact.

This superior seal is one of many long-life Link-Belt features. Others:

- *husky, high quality bearings*
- *precision-machined concentric rolls*
- *strong, rigid frames*
- *convenient grease fittings*
- *precision shaft-to-shell assembly*

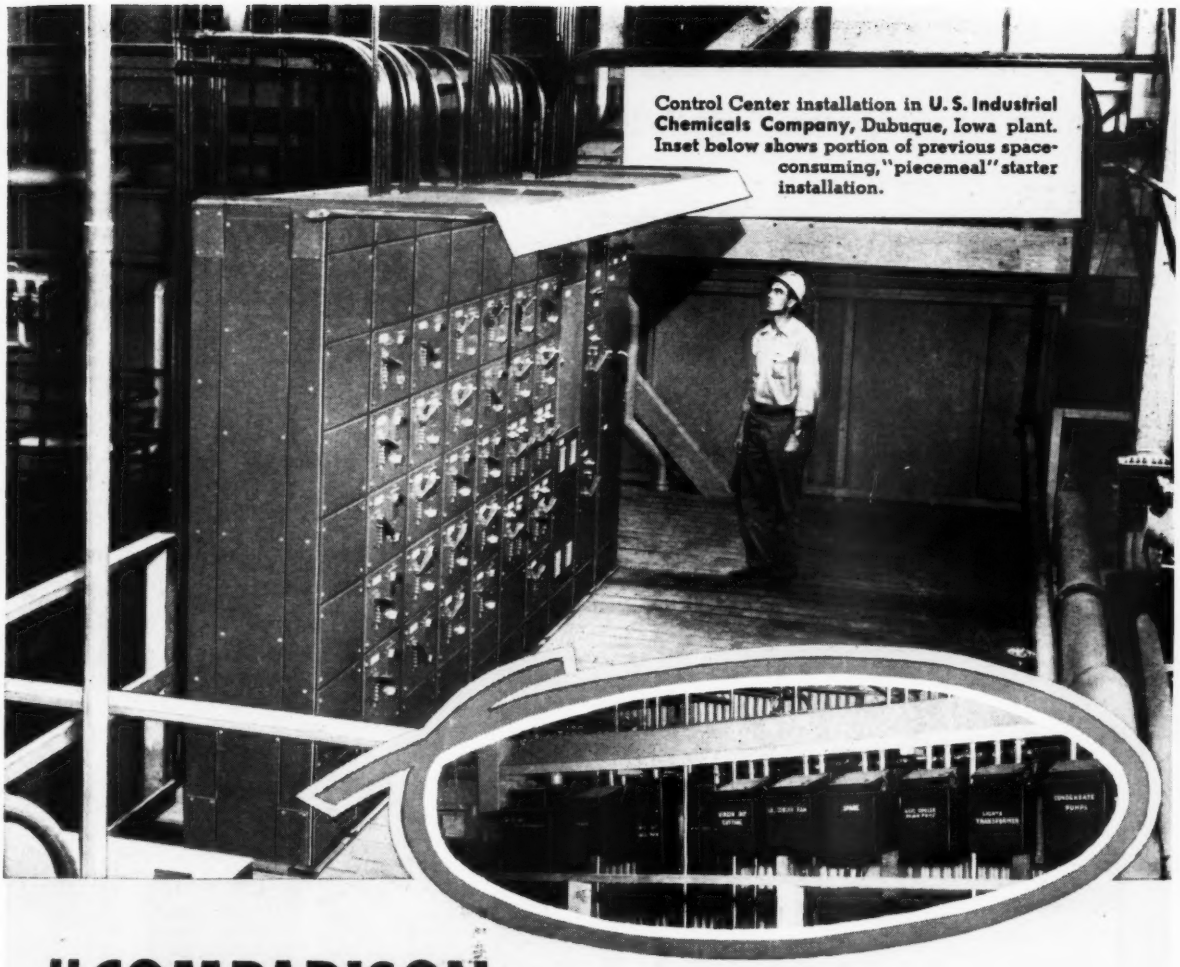
These features are standard in most Link-Belt idlers . . . industry's only comprehensive line. For details on specific series, call your Link-Belt office or authorized stock-carrying distributor. Or write for Book 2416.

**LINK-BELT**

**BELT CONVEYOR IDLERS**

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 14,289

**For more facts circle 578 on Reply Card**



Control Center installation in U. S. Industrial Chemicals Company, Dubuque, Iowa plant. Inset below shows portion of previous space-consuming, "piecemeal" starter installation.

# "COMPARISON convinced us that a SQUARE D Control Center offered us MORE!"

**These design features make Square D your logical choice, too...**

**INCREASED SAFETY** because bus bars are fully enclosed, rigidly supported and have ample cross section. Circuits are isolated by individually enclosed plug-in units. Disconnect handle designed for maximum operator protection.

**FLEXIBILITY.** Individual plug-in units or complete sections are easily added, removed or exchanged. Pushbuttons, pilot lights, and selector switches are readily added to unit doors.

**INSTALLATION ECONOMY.** All wiring channels are large and accessible from front without removing units. No "wire fishing."

**SPACE ECONOMY, TOO.** Up to six combination starters fit in a 20" x 20" x 90" section. Plug-in unit heights designed in space-saving increments of 3 inches.

**NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!**

**SQUARE D COMPANY**

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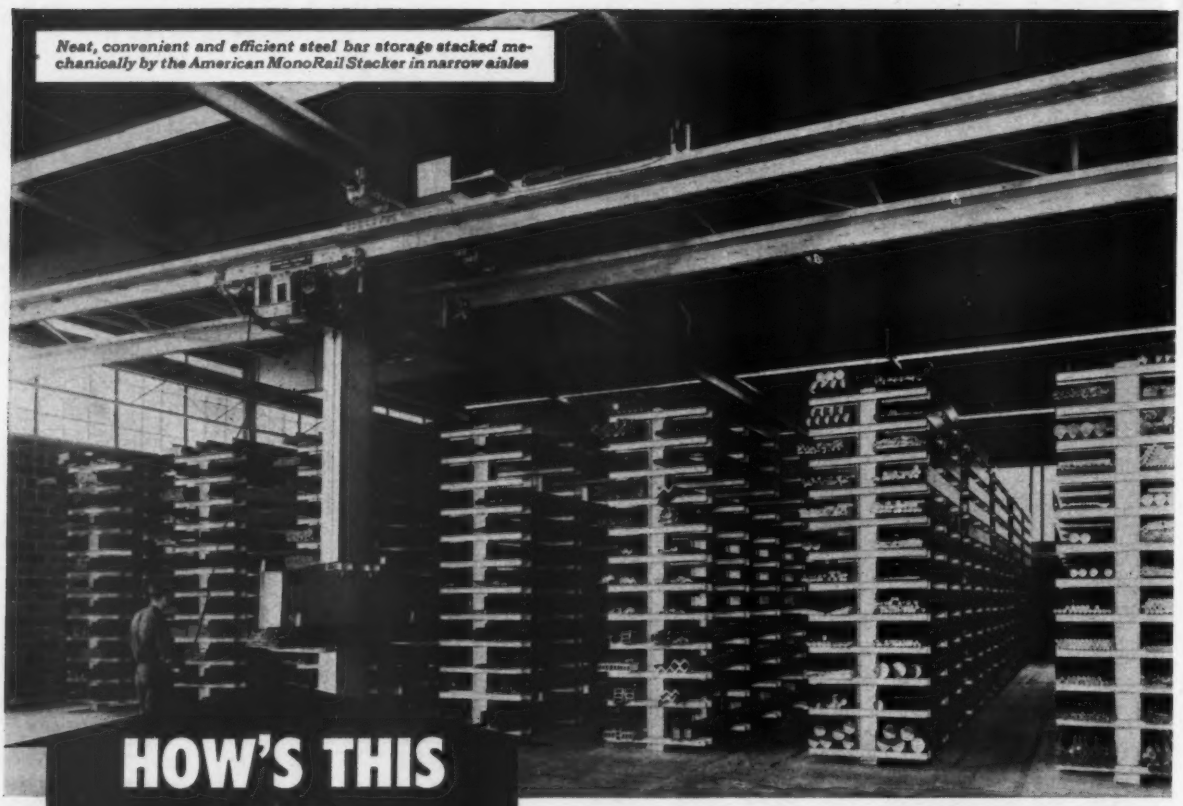
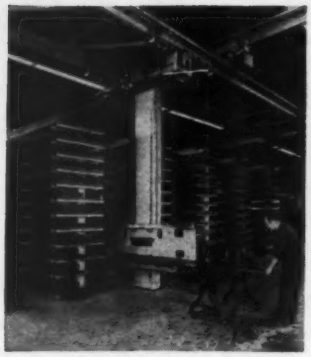


*Neat, convenient and efficient steel bar storage stacked mechanically by the American MonoRail Stacker in narrow aisles*

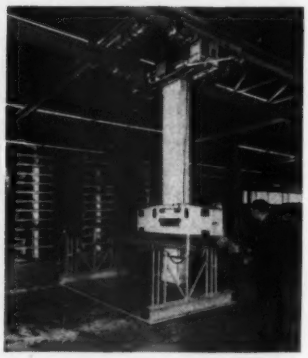
# HOW'S THIS FOR STEEL STORAGE!

American MonoRail engineers, working with Hawkridge Brothers Company, designed this system for storing bars, rods and other long steel shapes.

Note the extremely narrow aisles and maximum height of racks. Bars and rods, 20-22 feet long, are placed in pans 18 feet long. The American MonoRail Stacker transfers these pans to either side of an aisle for storage.



*MonoRail Stacker forks support bar in saw. Saw with extension rolls to any convenient spot in the warehouse.*



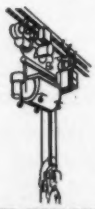
*American MonoRail Stacker lowers a banded bundle of bars over prongs which ingeniously splits bands, lets bars roll into trough for pick-up in a tray.*

*Photos: Courtesy of Hawkridge Brothers Company, Waterbury, Conn.*

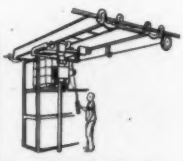
**Member of Materials Handling Institute - MonoRail Association**

AMERICAN
# MONORAIL
COMPANY

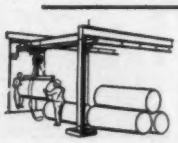
13123 ATHENS AVENUE, CLEVELAND 7, OHIO (IN CANADA—CANADIAN MONORAIL CO., LTD., GALT, ONT.)



AUTOMATIC DISPATCHER



STACKER CRANE



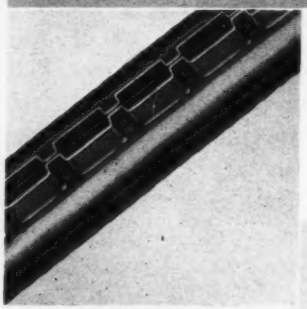
MANUAL MONORAIL

RETRACTABLE CRANE

**For more facts circle 580 on Reply Card**

# The Magnificent Modine

**establishes a new concept in gas unit heater styling and performance**

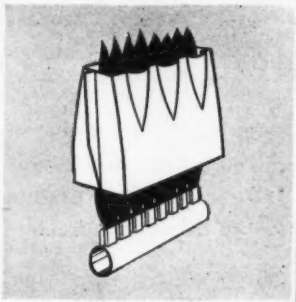


**SELF-CLEANING PORTS**

Knife-sharp stainless steel ports have four times the free area of drilled ports. Keen edges resist lodging of dirt and scale, maintain uniform flame.

**IMPROVED COMBUSTION**

Hooded combustion air inlets directly below each tube assure higher burning efficiency, minimize flame disturbance, eliminate combustion chamber.

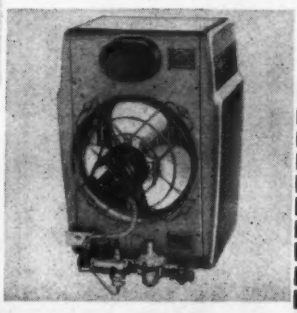


**FASTER, MORE UNIFORM HEAT**

Continuous, uniform flame from front to rear of individually and directly-fired tubes boosts radiant heat absorption and uniform heat distribution.

**SAFETY MEASURE**

Sturdy guard protects against hazards of exposed fan and provides resilient suspension for motor and fan assembly, further reducing vibration noises.



HERE at last is a gas unit heater so strikingly beautiful it can be installed with pride in the finest industrial, commercial and institutional buildings. Truly distinctive lines and attractive soft green finish are accented by sparkling medallion, grilles and panel of polished chrome. Yes, the new Modines are in a class by themselves—thanks to the skill of famous designer Jean Otis Reinecke.

And the new Modines are as great as they look—in performance, in economy . . . in safe, trouble free operation. Check the benefits shown at left. And, remember—improved *stainless steel* burners, plus a choice of *stainless or aluminized steel* heat exchangers, make Modines up to *50% lighter* than other units . . . less expensive to ship and install.

Ask the Modine representative listed in your classified phone book for full facts on the eight AGA-approved sizes—25,000 to 310,000 Btu. Or use the handy coupon below.

**MODINE MFG. CO.**
**1563 DeKoven Ave., Racine, Wis.**

Please send me immediately a free copy of new bulletin, "The Magnificent Modine Gas-Fired Unit Heater"

Name .....

Firm .....

Address .....

City .....Zone .....State .....

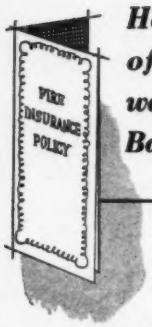
GU-1307

**Modine**
**GAS UNIT HEATERS**

*In Canada:*
Sarco, Ltd., Toronto

**For more facts circle 581 on Reply Card**

100,000-gal. Horton Watersphere built for sprinkler service at the Ball Brothers Company plant in Hillsboro, Illinois.




***How the cost of Fire Insurance was reduced at Ball Brothers Company***

# HORTON WATERSPHERE

## reduces fire insurance premiums 90 per cent for Illinois plant

A sprinkler system and a 100,000-gal. Horton Watersphere® are saving Ball Brothers Company 90 per cent of its former fire insurance premiums at their Hillsboro, Illinois, plant. The Watersphere provides a dependable gravity pressure water supply for the plant's sprinkler system. It is estimated that the sprinkler system and the Watersphere will pay for themselves in ten years from insurance savings.

The Watersphere was pickled and painted by the Horton Pickling Process prior to shipment from the Chicago plant.

Horton Waterspheres are built in sizes to 250,000 gallons. Write our nearest office for further information on Waterspheres or other Horton elevated tanks.

**Chicago Bridge & Iron Company**

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston
New York • Philadelphia • Pittsburgh • Salt Lake City • San Francisco
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*Plants in* BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

# HE KEEPS THEM ROLLING—
# THE MAN FROM ATLANTIC

The Atlantic specialist in industrial lubrication is a highly skilled expert. He's spent years in the study of every heavy lubricating and cutting-oil problem . . . and he's backed by other Atlantic specialists in lubrication research, production, quality control and marketing.

Atlantic's experience since 1870 has made us familiar with *your* lubricating needs. We've developed the products necessary to do any lubrication job perfectly . . . at the lowest cost . . . for every wheel that turns in industry.

Your company can benefit from our extensive experience and services. For further information on Atlantic's family of products for industrial lubrication and metal processing, write or wire Dept. M1, The Atlantic Refining Company, at the nearest office listed below.

**ATLANTIC**

**LUBRICANTS • WAXES**
**PROCESS PRODUCTS**

**PHILADELPHIA, PA.**
260 South Broad St.

**PROVIDENCE, R. I.**
430 Hospital Trust Bldg.

**CHARLOTTE, N. C.**
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**SYRACUSE, N. Y.**
Salina and Genesee Sts.

**READING, PA.**
First and Penn Aves.

**PITTSBURGH, PA.**
Chamber of Commerce Bldg.

**Atlantic Refining Company of Brazil**
Edificio Castello
151 Avenida Nilo Pecanha
Rio de Janeiro, Brazil

**Porto Rico Oil Company, Inc.**
Box 4832, San Juan, Puerto Rico

**For more facts circle 583 on Reply Card**

Pictured above are Sidney A. Lewis of the Walworth Sales Staff, Lewis A. Crabb of Machlett Laboratories and Jack I. Hoffman of the Connecticut Plumbing Supply Company, discussing plans for a new and complex piping installation. The smaller view shows a few of the lines for which Walworth PVC Valves and Fittings were selected.

# "We can count on Walworth for personal attention"

***Says Lewis A. Crabb, chief maintenance engineer of Machlett Laboratories, Springdale, Conn.***

When the Machlett Laboratories faced a specialized problem in the piping of waste acids of all types, including those used for etching, they needed more than fine valves and fittings. They required the kind of personal help and advice that comes only with sound experience.

Sidney A. Lewis, of the Technical Sales staff of Walworth sat down with Mr. Crabb, studied the problem and helped to select the exact Walworth equipment that would give the best possible service.

Backing up Walworth products with friendly capable technical help is regular procedure with all of our staff. On your next problem involving valves and fittings, call Walworth.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

**WALWORTH**

WALWORTH VALVES AND FITTINGS

60 East 42nd Street, New York 17, New York

SUBSIDIARIES: ALLOY STEEL PRODUCTS CO. CONOFLOW CORPORATION GROVE VALVE & REGULATOR CO. SOUTHWEST FABRICATING & WELDING CO., INC. M & H VALVE & FITTINGS CO. WALWORTH COMPANY OF CANADA, LTD.

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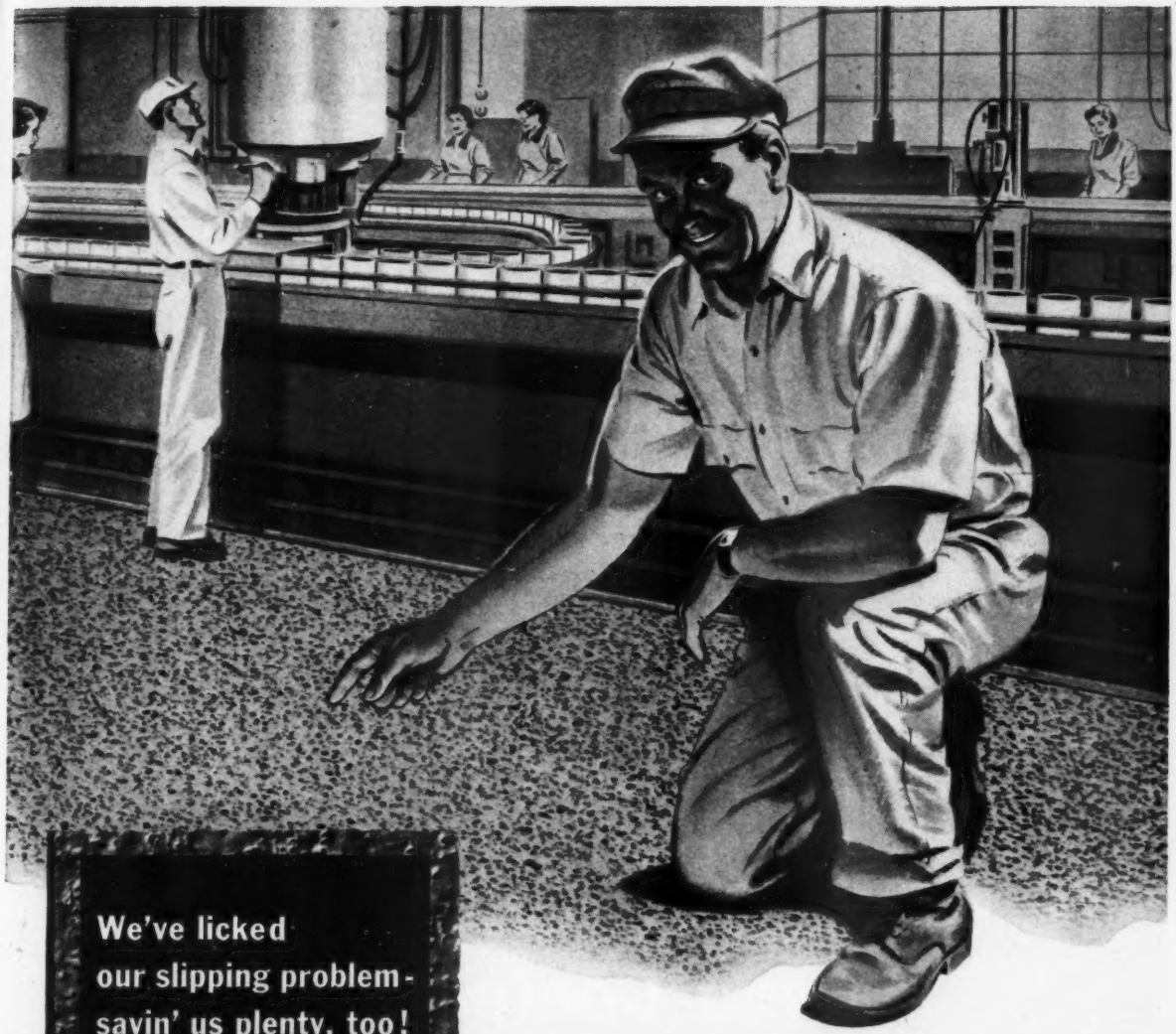


**We've licked our slipping problem - savin' us plenty, too!**

He's talking about ALGRIP—A.W. ALGRIP—the world's only abrasive rolled steel floor plate that provides super-safe footing under the *most hazardous* slipping conditions—on flat *or inclined* surfaces.

ALGRIP licks slipping and skidding hazards thoroughly by providing thousands of abrasive traction particles at every step. It's made by a patented process in which a grinding-wheel type of abrasive is rolled—*not coated*—to a controlled depth as an integral part of tough steel plate. Usage merely exposes more abrasive.

Look around for slipping hazards and make a test installation in your worst area. It'll save you plenty, too, as accident and insurance rates go down. Use it as an overlay or as independent flooring. ALGRIP fabricates easily and requires no maintenance.

# ALGRIP ABRASIVE ROLLED STEEL FLOOR PLATE

*ALGRIP—approved for safety by Underwriters' Laboratories*

**ALAN WOOD STEEL COMPANY**
**Conshohocken, Pa.**

Please send A.W. ALGRIP Booklet AL-S29

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

**OTHER PRODUCTS:**
A.W. SUPER-DIAMOND economy rolled steel floor plate—Plates—Hot and cold rolled sheet and strip—(Alloy and Special Grades)

**For more facts circle 585 on Reply Card**

**Got your tickets?**

**Reserved your room?**

**Planned your visit?**

# 8th National PLANT MAINTENANCE & ENGINEERING SHOW and Conference

## CLEVELAND PUBLIC AUDITORIUM
## JANUARY 28-31, 1957

***Attend the Conference, too . . .***
One of the largest industrial conferences of its kind. Listen to the experts . . . top level discussion, conferences and panels on topics of prime importance to the maintenance and engineering executive.

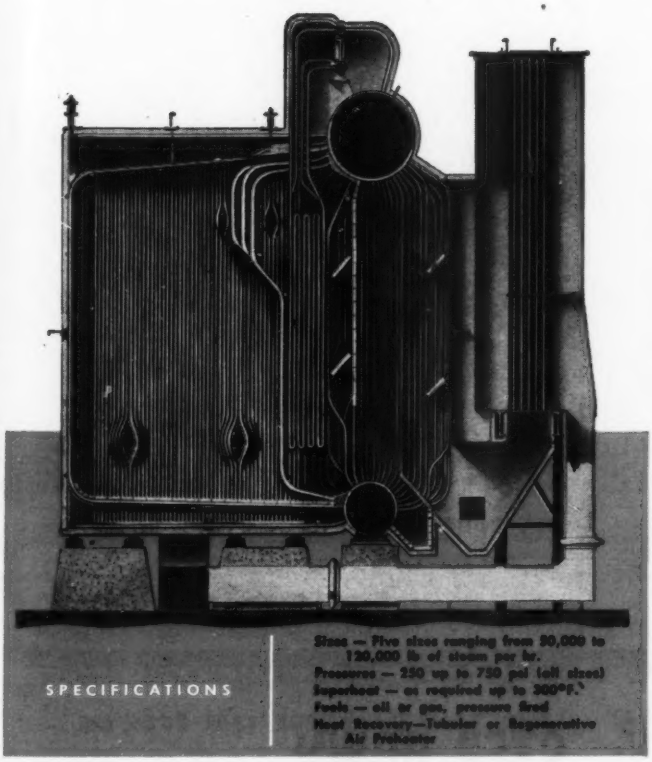
*Write for free tickets to the Show and information about the Conference to:*

**Plant Maintenance & Engineering Show**
**CLAPP & POLIAK, INC.**
**341 Madison Avenue**
**New York 17, New York**

***If your answer is YES you're ready to spend four of the most important days on your job in 1957***

- ✓ In no other way can you see so many products and accumulate ideas to increase plant efficiency, reduce costs and increase production in the coming year.
- ✓ Over 400 leading manufacturers will exhibit everything in machines, equipment, supplies and services to answer the needs of your plant.
- ✓ Press buttons, pull levers, turn switches . . . see, touch, and try for yourself to help you evaluate and compare competitive products. Talk to the thousands of manufacturers' technical experts who can help you solve your problems. ***Plan now to attend!***

# THE VU-55 ... AN OUTSTANDING BOILER BUY FOR CAPACITIES FROM 50,000 TO 120,000 LB OF STEAM PER HOUR!



SPECIFICATIONS

Sizes — Five sizes ranging from 50,000 to 120,000 lb of steam per hr.
Pressures — 250 up to 750 psi (all sizes)
Superheat — as required up to 300°F.
Fuels — oil or gas, pressure fired
Heat Recovery—Tubular or Regenerative Air Preheater

The VU-55 – a development of Combustion's basic *V*ertical *U*nit design – offers features never before available in a boiler of its capacity range. If your steam needs call for a unit in the 50,000 to 120,000-lb class, you will find it worth while to consider the economic and operating advantages assured by these VU-55 features:

**TANGENTIAL FIRING.** More than 20 years of application experience have established the exceptional advantages of tangential firing, illustrated and briefly described below. About 90 percent of Combustion's large utility installations use this advanced method of firing.

**DOUBLE WALL, PRESSURIZED CASING.** The latest development in casing construction for pressure firing of boilers in the size class of the VU-55, this casing, as illustrated and described below, is designed to assure lifetime tightness with minimum heat loss. Pressure firing permits the elimination of an induced draft fan with its attendant operating and maintenance costs.

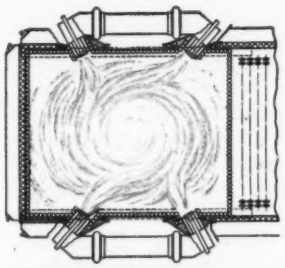
**TANGENT FURNACE TUBES.** The VU-55's furnace tube arrangement provides complete heat-absorbing, water-cooled protection on all furnace walls. Furnace maintenance is minimized, refractory expense is eliminated, heat absorption rates per sq ft are higher.

**SIMPLIFIED ERECTION.** Shop assembly of furnace wall panels and boiler screen tubes saves time and money in handling, transportation and erection.

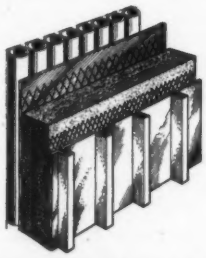
**HIGH STEAM QUALITY.** Equipped with a large (60-in.) steam drum, the VU-55 has generous water capacity and steam reservoir space. C-E drum internals assure high quality steam at all ratings.

**STREAMLINED EXTERIOR.** The overall appearance of the VU-55 reflects the efforts of its designers to achieve a completely unobstructed casing, while retaining adequate access wherever required and every facility for convenient operation. There are no outside downcomer tubes, and ducts from air heater to burners are beneath the furnace floor.

**Your request for further information on the VU-55 Boiler will receive prompt attention**



**PLAN VIEW OF FURNACE** showing arrangement of burners for tangential firing. Flame streams from the four burners impinge upon one another at high velocity, creating a turbulence unattainable by any other method of firing. The result is rapid and complete combustion. As the gases spiral upward, they sweep all furnace heating surfaces, assuring a high rate of heat absorption.



**PERSPECTIVE OF FURNACE WALL.** Construction consists of tangent tubes backed up successively by welded steel panels, 4 inches of high quality insulating material and an outer steel casing formed as shown to provide adequately for expansion and assure ample strength. Low heat loss and the tightness required for pressure firing are assured by this double-wall construction.

## COMBUSTION ENGINEERING

Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.
CANADA: COMBUSTION ENGINEERING-SUPERHEATER LTD.

C-E B-938A

STEAM GENERATING UNITS · NUCLEAR REACTORS · PAPER MILL EQUIPMENT · PULVERIZERS · FLASH DRYING SYSTEMS · PRESSURE VESSELS · HOME HEATING AND COOLING UNITS · DOMESTIC WATER HEATERS · SOIL PIPE

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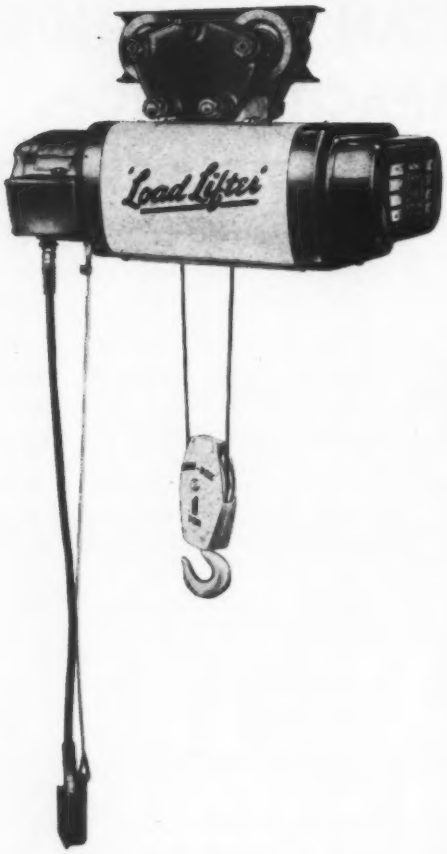
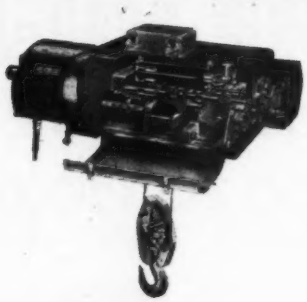


**The Series "700" 'Load Lifter'** has the fewest possible working parts to simplify maintenance. All units are easily accessible for inspection; the hoist can be serviced in the air. Down time is reduced — real economy for you.

**This efficient motor-driven trolley** provides effortless hoist travel at the push of a button. Available for Series "700" 'Load Lifter' Hoists already in service. New hoists can be so equipped before shipment; no additional assembly required.

# STEP UP lifts per hour

Lifting loads up to 15 tons on a heavy-duty cycle is a job for a tough hoist. The Series "700" 'Load Lifter' Electric Hoist more than meets every requirement in speed, stamina and safety. A ton can be lifted a foot a second. Extra ruggedness is built into every part to assure top performance under the worst conditions of service. The automatic load and motor brakes are interlocked to operate simultaneously, yet either brake *alone* can hold the full load safely. Only 24 volts at the pendant control is a plus in safety. Two-speed models provide a "low" that is 1/3 the speed of "high".

# STEP DOWN cost per lift

The Series "700" 'Load Lifter' is available with lug or hook and push-type, hand-geared or motor-driven trolley. Learn how this husky electric hoist is saving time, effort and money in all kinds of plants, and how it can do the same for you. *Ask your "Shaw-Box" Distributor for details or write us for Bulletin 410.*

57 G-1

MAXWELL MANNING M&M & MOORE INC. TRADE MARK

'Load Lifter'® **ELECTRIC HOISTS**

**MANNING, MAXWELL & MOORE, INC.**

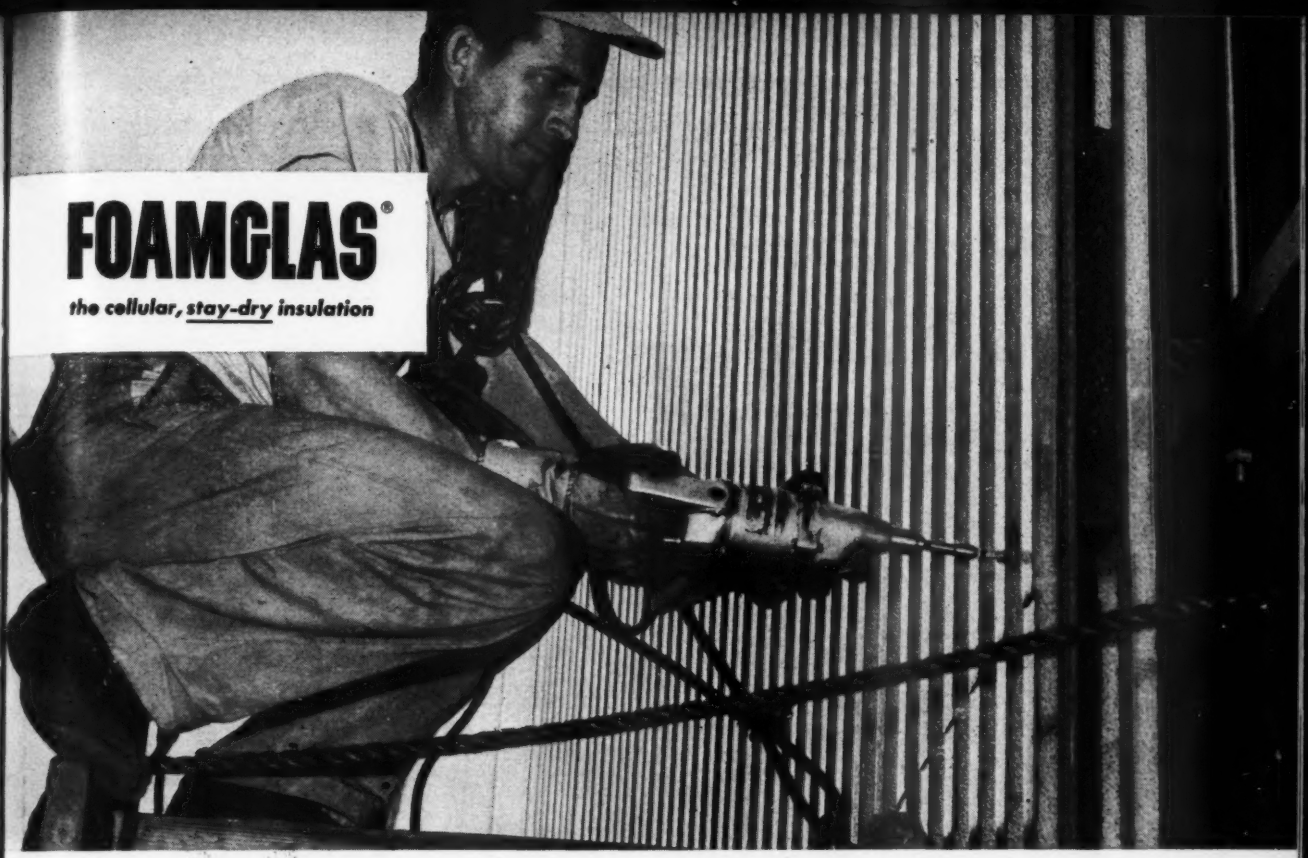
**SHAW-BOX CRANE & HOIST DIVISION**

**362 West Broadway • Muskegon, Michigan**

Builders of "SHAW-BOX" and 'LOAD LIFTER' Cranes, 'BUDGIT' and 'LOAD LIFTER' Hoists and other lifting specialties. Other Divisions produce 'ASHCROFT' Gauges, 'HANCOCK' Valves, 'CONSOLIDATED' Safety and Relief Valves, 'AMERICAN' and 'AMERICAN-MICROSEN' Industrial Instruments, and Aircraft Products.

**In Canada:** *Manning, Maxwell & Moore of Canada, Ltd., Avenue Road, Galt, Ontario.*

**For more facts circle 588 on Reply Card**




Duquesne Brewing's 3½" thick curtain wall was erected at job site. Ribbed aluminum back-up sheet was placed against supporting members and secured with drive screws. FOAMGLAS blocks were placed against back-up sheet and temporarily secured with adhesive. Ribbed aluminum facing sheet was then set in place and secured with self-tapping screws on 8" centers driven completely through facing sheet, FOAMGLAS and back-up sheet. Drilling through the FOAMGLAS did not impair its inherent moisture resistance.

At Duquesne Brewing Company's new bottling plant...

## This FOAMGLAS insulated aluminum curtain wall went up fast—cost only $1.31 per square foot!

This ribbed aluminum curtain wall "sandwich"—insulated with a core of strong, moisture-proof FOAMGLAS—was erected faster than conventional walls at a cost of just $1.31 per square foot. The Duquesne Brewing Company of Pittsburgh, Pa., used it to build a new bottling plant designed and engineered by Peth and Reed, Pittsburgh.

Selection of FOAMGLAS as the core insulation was doubly important. First, its unusual strength, dimensional stability and rigidity helped make stronger wall panels—eliminated possible sagging or buckling after installation.

Most important, however, was the FOAMGLAS structure of minute glass cells, each a dead air insulating unit permanently sealed against moisture. Duquesne faced a possible condensation problem in the bottling plant walls. To solve it, the aluminum siding's ribs were designed to serve as small "chimneys" for condensation drainage. That meant moisture would drain across the surface of the core insulation. Only FOAMGLAS, being inherently moisture-proof, could serve under these conditions... and could be counted on for a constant insulation value for the life of the building.

Whatever *your* insulating problem, it will pay you to rely on FOAMGLAS for dependable, long-life insulating service. It's moisture-proof . . . inorganic . . . incombustible . . . dimensionally stable . . . strong and rigid . . . light in weight . . . acid-proof . . . vermin-proof. Prove these properties to yourself with six simple tests easily performed in your own office. Send for a FOAMGLAS sample and complete testing directions today. Address . . .

Future enlargement of the Duquesne Brewing bottling plant can be accomplished economically with aluminum-FOAMGLAS curtain wall. Existing wall can be removed, additional structural members erected and dismantled wall sections re-used to enclose expanded area.

**Pittsburgh Corning Corporation**

Dept. PE-17, One Gateway Center
Pittsburgh 22, Pennsylvania

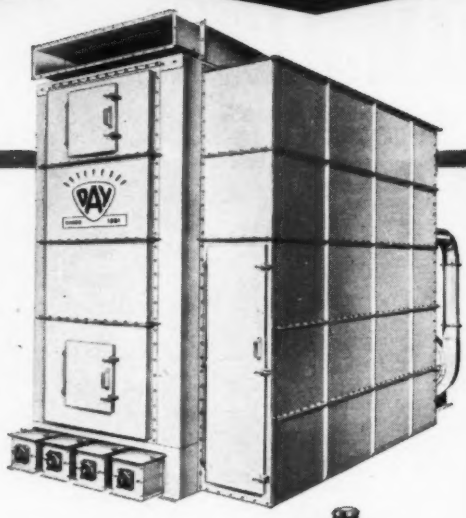
In Canada: 57 Bloor St. W., Toronto, Ontario

PC ® also manufacturers of PC Glass Blocks

**For more facts circle 589 on Reply Card**

**DUST CONTROL** | **BULK STORAGE** | **PNEUMATIC CONVEYING**

# DAY PRODUCTS
## SERVE INDUSTRY



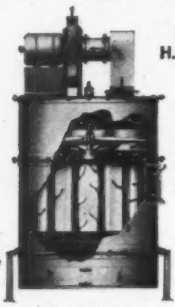
### . . . CONTROLLING DUST

**DAY "AC" Reverse-Jet DUST FILTER** ● Dollar for dollar, feature for feature, you get more for your money with a DAY "AC" filter. Economical first cost and low maintenance PLUS the fact sub-assembly by DAY saves up to 75% on installation costs. ● Felted filtering media captures sub-micron dust particles with 99.99+% efficiency. Media porosity is maintained by self-adjusting, high pressure, reverse-jet blow rings. ● DAY filters occupy less floor space—need less headroom—are furnished to operate on suction or pressure. ● May be installed inside or outside; outside units completely weatherproof. **Write for Bulletin 359 for complete facts and engineering data.**

(Licensed by H. J. Hersey, Jr.)

**DUAL-CLONE DUST SEPARATOR**

Exclusive DAY design provides high efficiency with low horsepower requirements. **Write for Bulletin 49DC.**

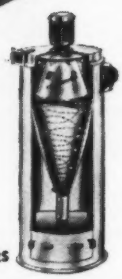


**TYPE "RJ" DUST FILTER**

Surge of high velocity reverse air maintains filter media porosity of this "packaged" dust filter. 99.99+% efficiency. **Write for Bulletin 560.**

**TYPE "G" EXHAUST FANS**

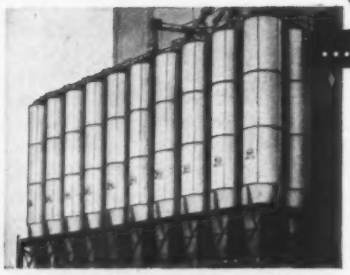
High air delivery per horsepower required. Statically and dynamically balanced; designed exclusively for dust control applications. **Write for Bulletin 471.**



**DAY UNIT DUST CONTROLLERS**

Complete, low cost unit combines high efficiency of DAY Dual-Clone and Exhauster. Ideal for remote locations. **Write for Bulletin 510.**

**A SINGLE UNIT OR A COMPLETE DUST CONTROL SYSTEM**

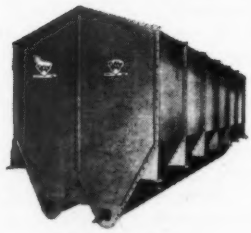


DAY Vertical Type Bulk Storage Bins

### . . . HANDLING AND STORING BULK MATERIALS

**Vertical or horizontal bins,** special sizes or groups furnished to meet production needs; air lock rotary valves, twin screw feeders and other auxiliary equipment optional. DAY bins need no field riveting, soldering or welding. Built and shipped in easily erected bolted sections. **Write for Bulletins 529 and 549.**

**AIR LOCK ROTARY VALVE**



**HORIZONTAL TYPE BULK MATERIAL BIN**

**INDIVIDUAL BULK EQUIPMENT UNITS OR A COMPLETE BULK MATERIAL SYSTEM**

### . . . PNEUMATIC CONVEYING

**DAY Pneumatic Conveyor equipment and systems** provide a modern method of bulk material handling. Self-cleaning to prevent contamination or product deposits in system. Speed of operation improves plant efficiency. **Write for details.**

75 YEARS — SERVING INDUSTRY SINCE 1861

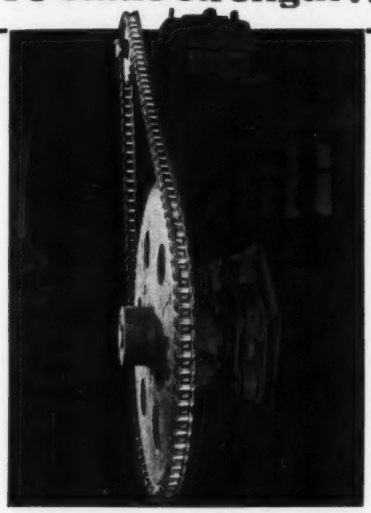
## *The* DAY *Company*

807 Third Ave., N.E., Minneapolis 13, Minn.
P. O. Box 70G, Ft. William, Ontario

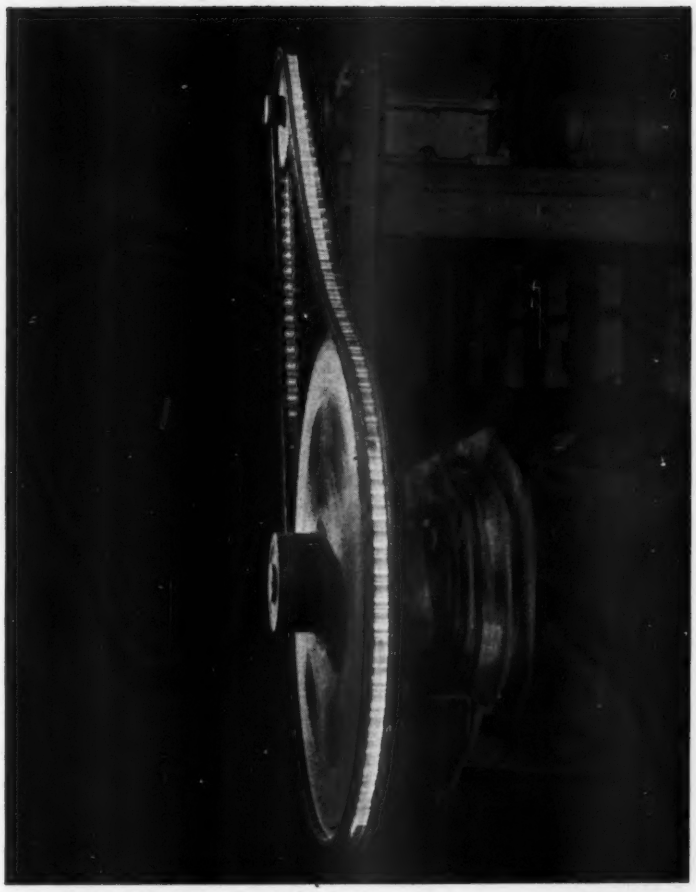
Branch Plants: Buffalo, Ft. Worth, Toronto
Representatives in Principal Cities

**For more facts circle 590 on Reply Card**

## To static strength . . .



**RESISTANCE TO TENSILE STRESS** is achieved by use of properly heat-treated, accurately-machined sidebars made of premium steel and fitted with properly-hardened pins, bushings and rollers. But to resist *operational* stresses, additional controls over accuracy, uniformity and roller resiliency are essential.



**STRENGTH OF CHAIN IN MOTION** is accomplished through tensile strength *plus* special Link-Belt refinements. These include pitch-hole preparation, micro-finish of parts, special processing of sidebars, pre-lubrication and rigid quality control from initial selection of materials to final protective boxing.

# LINK-BELT adds great

# *dynamic strength*

## that gives Precision Steel Roller Chain on-the-job endurance

WHEN selecting roller chain for your drive or conveying job, durability under actual working conditions is what you're after. That's *dynamic strength*—and it's built into *every length* of Link-Belt Precision Steel Roller Chain. From it comes resistance to such operating stresses as engagement with sprockets, shock of starting loads, centrifugal loads and others.

No one feature can establish high dynamic strength. It results from a combination of Link-Belt "extras" . . . plus other special methods of design, manufacturing and processing. On the job, it means extended life, positive action, less maintenance.

Ask your Link-Belt office or authorized stock-carrying distributor for Book 2457, covering single and multiple width roller chain and sprockets in ¼ to 3-inch pitch . . . and in double pitch, 1 to 3-inch.

**LINK-BELT**

**ROLLER CHAIN & SPROCKETS**

**LINK-BELT COMPANY:** Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 14.123

**LINK-BELT gives you dynamic strength that comes from these important EXTRAS**

**PRE-STRESSING** of multiple width chain provides uniform load distribution.

**SHOT-PEENED** rollers have greater fatigue life, added ability to withstand impact.

**CLOSE HEAT-TREAT CONTROL** — coupled with rigid testing insures uniformity.

**LOCK-TYPE BUSHINGS** (applied on a range of sizes) end a cause of stiff chain.

**For more facts circle 591 on Reply Card**

# NEW PRODUCTS AND PROCESSES summarized for your convenience

*Edited by M. E. Heniken*

## 1—CLEANER for zeolite, other cation exchangers

Kleen-Ion is announced as a new ion exchanger cleaner. After continued use, zeolite and other cation exchangers may lose exchange capacity as they become fouled with precipitated inorganic materials, biological growths, mud and silt. Unless zeolite material has chemically deteriorated, Kleen-Ion will aid in cleaning the zeolite bed, manufacturer states, decreasing pressure drop caused by fouling and restoring the softening capacity. Kleen-Ion can also be used to keep the zeolite clean. W. H. & L. D. Betz.

## 2—WELDED GRATING is stronger and lighter

Gold Nugget Welded Grating is introduced to meet the need for an improved heavy duty open steel floor grating of greater strength and economy. Due to improved design, the primary load bar of this grating provides 22 per cent more

strength and 14 per cent less weight, manufacturer states. The primary load bar is a miniature I-beam with advantages of a true structural member. Other features announced for Gold Nugget Welded Grating include: ⅜-in. projection weld nugget for rigidity and strength; vertical alignment of main load bars assured; all bars are load carrying bars: and an anti-skid pattern. The new grating is suggested for power houses, loading docks, refineries, fire escapes, drain grates, all heavy duty platforms. The Globe Co.

**Reader Service Cards on pages 219-220 make it easy to get further information on any of these products. Just circle the item numbers of the products you would like to know more about.**

## 4—GLASS CLOTH TAPE is strong, flame resistant

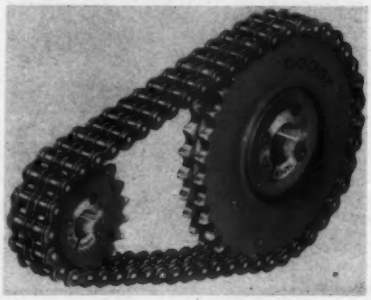
Permacel 621 is announced as a flame resistant, high strength glass cloth tape for sealing and binding of joints in hot air ducts, sealing and protecting ducts or pipes carrying high temperature exhaust fumes, and for identification markings where flameproofness is required. The tape also is used for bundling, reinforcing and holding applications where strength, abrasion resistance and permanency are required. Average tensile strength is 150 lb/in. and adhesion is 65 oz/in. Elongation is 5 per cent and overall thickness is 8 mils. Tape is composed of a glass cloth backing and a self extinguishing rubber base pressure-sensitive adhesive mass. Backing is flameproof, says company, and adhesive will extinguish itself when flame source is removed. Tape comes in 60-yd rolls in assorted widths. Permacel Tape Corp.

## 5—FILTER removes contaminants from gas

This high pressure gas filter is introduced for removal of contaminants from gaseous streams and for protection of turbine expanders, compressors, pumps, nozzles and blowers in process industries. According to manufacturer, the resin-impregnated cellulose filter elements have a 99 per cent efficiency rating when tested with U. S. Standard test dust (fine) and are convoluted for extended area. Each unit is engineered to requirements of application. Purolator Products Inc.

## 6—CHAIN SPROCKETS are easy-on double strand type

New additions to this manufacturer's Taper-Lock line are double strand roller chain sprockets requiring no reboring or other machining for installation on shafts. Available in pitch sizes from ½ to 1 in., the new double strand sprockets are designed to meet the need for greater capacity roller chain drives with easy-on, easy-off features of Taper-Lock. They may be used with company's double



strand chain or other standard precision chains conforming to ASA specification.

Several advantages are announced for these sprockets. Company points out that you can take them (together with bushings of desired shaft size) directly off the shelves of distributors and mount them quickly and securely without reboring, key seating, or set screw machining—regardless of whether shaft is turned and ground or cold rolled, standard or normally undersized. Installed cost of Taper-Lock Sprockets is reported usually less than that of sprockets which have to be bored to size. Another economy feature noted is that the bushing can be used over and over again; and if sprocket becomes worn, only the tooth part need be replaced. A Taper-Lock Sprocket occupies no more space on the shaft than other sprockets and its flush design (even screws are recessed) adds to safety and neat appearance. Dodge Mfg. Corp.

## 3—DEFLECTION HANGERS cut noise, vibration

Vibro-Hangers, for suspending disturbance-generating equipment and piping systems, are designed to provide maximum freedom from vibration transmission. As the high-deflection vibration-isolating medium, these hangers utilize a helical steel spring designed to withstand high temperatures without permanent set, and low temperatures without loss of resiliency. According to manufacturer, these isolation units provide the greatest deflections and load capacities available, and are suited for eliminating transmission of vibration and noise where low frequency disturbances are present, where extremes of temperature are encountered, or where the equipment is installed in critical locations. Effective load range is from 50 to 3800 lb. The units are supplied without any housing, or in a box-type or a U-bracket-type housing. The Korfund Co., Inc.

## 7—RUST PREVENTIVE protects metal surfaces

Froil is described as a corrosion-protective oil offering three-way protection: a moisture- and vapor-proof barrier against corrosion, water displacing properties, and fingerprint removal. Company says it not only neutralizes and removes corrosive attack due to fingerprints and shop soil, but has the added advantage of giving months of protection against rust. Polished metal parts treated with Froil under humidity box testing are reported to have withstood 100 per cent humidity at 120 F for two months without rusting. Froil is suggested for protecting precision parts, castings, dies,

# 7 years' trouble-free service on HCL acid with this Crane diaphragm valve

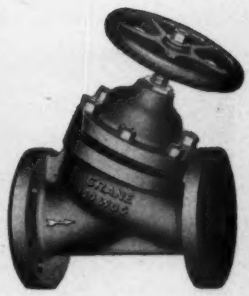
How do Crane diaphragm valves perform on acid services?

This major container manufacturer has impressive proof. Seven years ago, the Crane 4-inch No. 1615-RN rubber-lined diaphragm valve shown above was installed on 17 deg. Baume hydrochloric acid service. The acid is used to clean evaporators and surface condensers. *Not once has this Crane diaphragm valve failed to function—not once has it failed to hold tight.*

Previously, this plant used conventional all-metal valves. These had to be replaced regularly as an expendable material. The Crane valve has eliminated all replacement costs by providing maintenance-free performance—and from all appearances will continue to do so for years to come.

You just don't get service like this from ordinary valves. Crane valves are so expertly designed, have such quality materials and are so carefully machined and tested that cost-free records like this are the rule rather than the exception with Crane users.

Get the facts on Crane diaphragm valves from your local Crane Representative, or write to address below.



**CRANE VALVES & FITTINGS**

**PIPE • KITCHENS • PLUMBING • HEATING**

*Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas*

**For more facts circle 592 on Reply Card**

# NEW PRODUCTS

(Begins on page 170)

tools, and machined and polished parts during manufacture, storage and shipment. It may be used as a routine protective oil for machines and precision tools. It may be applied by brush, dip or spray, or by wiping. Soiled metal surfaces should be properly cleaned before applications. Octagon Process, Inc.

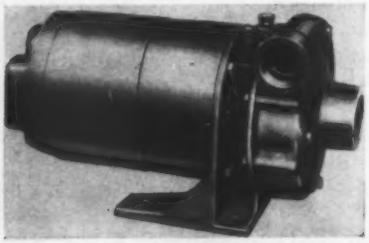
## 8—FLEXIBLE DUCT takes out corrosive fumes

Flexible Air Duct Type 47-1D features a rugged, sturdy air-tight construction, it is announced. This construction combines vinyl coated fiber glass fabric with a supporting spiral made from corrosion-resistant type stainless steel and is designed to give maximum resistance to corrosive fumes which may arise from chemical processes. It is made by a process which mechanically locks the fabric into the steel spiral, says manufacturer. It is reported easy to cut and install, to bend easily 90 to 180 deg, and to have good air flow characteristics. Company says this duct will handle most corrosive fumes with exception of formic acid, phenol, hydrochloride and hydrofluoric acid. More information is in Data Sheet S-10. The Wiremold Co.

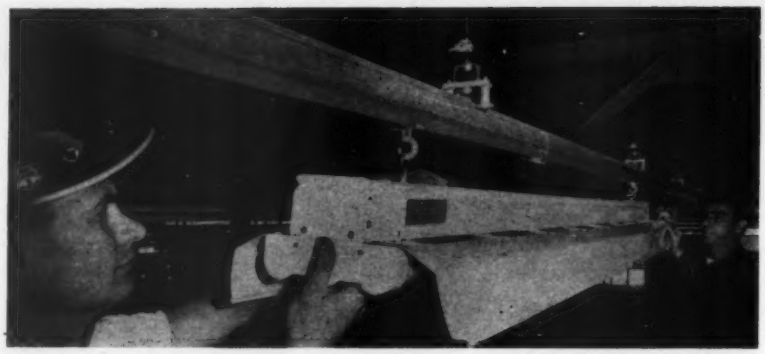
## 9—CENTRIFUGAL PUMPS, single stage, close coupled

Announced as ideal units for air conditioning, booster, condensate and other services are these close-coupled centrifugal pumps, Figures 3642 and 3643. Of single stage, enclosed impeller type, they are reported to offer such advantages as efficiency, simplicity and long service. Since motor and pump are a single complete unit, installation is quick and inexpensive, company points out; you simply bolt the compact unit down and connect piping and power.

It is noted that once the pump is primed, the mechanical seal is protected



from running dry. Discharge may be located in any one of eight positions, with drain, vent and priming openings provided. Because the casing is vertically split, maintenance can be accomplished without disturbing piping connections. Figure 3642 comes in 1- and 1¼-in. sizes with motors from ¼ to 2 hp, capacities to 100 gpm. Figure 3543 comes in 1½- and 2½-in. sizes, with 3- to 7½-hp motors, capacities to 350 gpm. Specifications in Bulletin 624. Goulds Pumps, Inc.



## 10—ROLL-IN METHOD speeds and simplifies busway installation

Announced jointly by Motor City Electric Co. and General Electric Co., this roll-in method of busway installation is estimated to offer cost reductions up to 50 per cent. On lighting installations in which it has been tried, it is reported that complete systems were installed in about half the time normally required for hanging fixtures alone. In these installations, the roll-in technique, which employs a winch and roller-type hangers, allowed four men to hang GE's Type LTG Busway and closely spaced fluorescent fixtures at an average of 5 fpm.

In the new method, both busway and lighting fixtures are, in a single operation, rolled into place, assembly-line fashion. From a platform at one end of a plant, one length of busway after another is placed on roller-type hangers and then mechanically and electrically joined to the preceding length. At the same time, fluorescent fixtures, which the busway feeds and supports, are hung. A winch at opposite end of plant continuously draws this busway with its lighting fixtures through roller-type hangers until the entire system is in its place. This, it is noted, eliminates repeated relocation of installation platforms and other equipment, it lets both busway and fixtures be installed before permanent flooring is laid in the area or the machinery is put in place. General Electric Co.

## 11—PAINT GUN sprays it on at high speed

Built around the principle of a centrifugal pump, the Rogers Rotary Magic Painter literally "throws" paint on any surface, says manufacturer; its self-contained motor spins the rotor blades at speeds to 22,000 rpm, pumping the paint from a twist-on aluminum can. The paint spread is controlled from a fine line to more than 1 ft by means of the gate-like opening. Overspray and masking are cut to a minimum it is claimed. Although originally developed for the home market, this 3-lb unit has industrial applications, too. Adaptable to inside or outdoor maintenance, the gun can be used with water-base or oil paints. It is suitable for stencilling and has been used to apply a fine oil spray to finished machine parts. Martin Stove and Range Co.

## 12—BURDEN CARRIER for heavy loads, rugged use

Model A-1014-18, a standard straight-frame burden carrier, is announced as well suited for steel mills, metal fabricating plants, paper mills and other industries in which heavy loads must be transported. Its capacity is 6000 lb, and its platform is 46 in. wide, 89 in. long, and 33½ in. high. Battery operated, this truck has magnetic contactor-type control, four speeds forward and four reverse, and four-wheel steer with automotive-type horizontal wheel. It has an all-welded steel frame, and solid rubber flat-base tires. Mercury Mfg. Co.

## 13—ROOF VENTILATORS come in four models

Propeller type power roof ventilators with certified ratings are announced as featuring a redesigned fan wheel that produces optimum efficiency when operating within the type of enclosure formed by a power roof ventilator housing. The new line includes four models: upblast type exhaust ventilator; hood type exhaust ventilator; hood type supply ventilator, pictured, and air intake hood. All are of heavy-gage welded steel construction, with surfaces phosphatized for rust resistance and finished in baked enamel. Each model is provided with a flanged base for easy curb mounting. The hood types are described as completely weatherproof. American Blower Corp.

## 14—MASONRY BLADE is low cost, handy cutter

Called the Type S-200-V, this multi-purpose tungsten carbide diamond cutting blade is introduced for all types of hard and soft masonry materials—brick, tile, refractory, block and concrete. In

# How it Works!

## Only new Sarco TD steam trap uses kinetic energy of steam to close valve

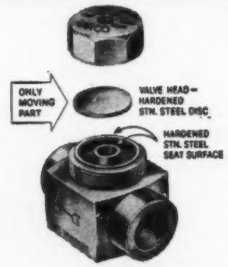
GAS MANTLES have been replaced by electric lights, steam locomotives by diesels, propeller planes by jets.

*Now*, the use of the kinetic energy of steam principle gives us a modern type of steam trap.

The Sarco TD obsoletes all other types for most 10 to 600 psi installations. For example, it operates without a valve closing device—no bucket, float, bellows, pins, levers or gaskets.

*Glance below* and you'll agree that no other steam trap is even similar to the Sarco TD!

*For a trial installation—write today.*



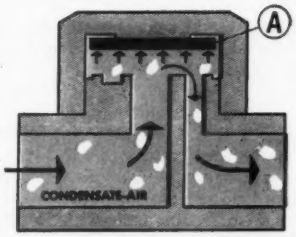

**Only 3 parts...all stainless steel**

Sizes ⅜ to 1"—each body is as small as a tee fitting! Capacity is determined not by a bulky body but by the effective orifice, valve action, pressure drop and condensate temperature.

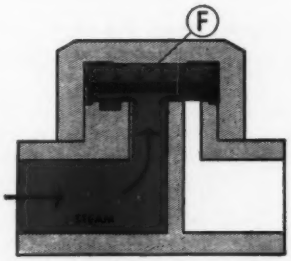
### Many Advantages

1. *Practically no maintenance*—no valve mechanism, no narrow channels. Trouble-free simple design. Only 3 parts—all stainless steel.
2. *One trap for all pressures*—self-adjusting. One large capacity seat for 600 psi as for 10 psi. No changes or adjustments.
3. *Operates equally well on all loads*—on heavy, light or no condensate load. No prime to lose. No adjustments.
4. *No steam leak required*—to operate the Sarco TD. Closes tight against steam.
5. *Discharges at steam temperature and vents air* and air-steam mixtures at start-up and during operation.
6. *Freeze-proof*—when installed with outlet down, free to drain.

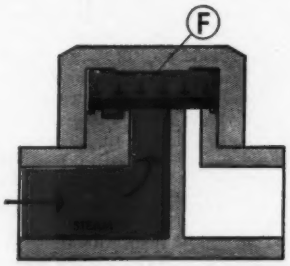
**Only Sarco TD Thermodynamic Steam Trap Uses This Unique Operating Principle Which Permits Trouble-Free TD Design**




**1.** Inlet pressure raises disc "A" from seat... immediate discharge of air and condensate at steam temperature.




**2.** Steam follows the condensate and the high velocity jet across the bottom of disc "A" creates a low pressure area (Bernoulli effect)...the jet is deflected into chamber "F" where it builds up pressure by recompression and this pressure acts on the top of the disc "A"...




**3.** Pressure in chamber "F", acting on full top area of disc "A", exceeds force of incoming steam and low pressure area under the disc...and immediately forces it down, closing the inlet. As condensation decreases the pressure in chamber "F", the disc rises and steps 1 or 2 repeat.

***60-day trial convinces...No obligation...Use coupon!***

**SARCO**

Steam Traps—Temperature Regulators—Strainers—Heating Specialties

**SARCO COMPANY, INC., Empire State Bldg., New York 1, N. Y.**

Please send me Sarco TD Steam Trap and strainer for 60-day trial. Size_____

For installation on_____

Name_____ Title_____

Firm_____

Address_____

City_____ State_____

2184-C

**For more facts circle 593 on Reply Card**

# NEW PRODUCTS

(Begins on page 170)

the popular 14-in. size it sells for $152.00 and is reported to exceed the performance of many higher-priced blades. It is claimed ideally suited for plants having need for a single blade to handle a variety of masonry cutting jobs. Manufacturer says that this blade has maximum diamond concentration along the cutting edge, and utilizes a high-retention process to retain the diamonds for longer cutting life. Cardinal Engineering Corp.

## 15—ELECTRONIC TIMER has improved housing design

Among features announced for the Type ET Electronic Timer is an improved line of matched industrial housings for various mounting conditions. In the case of the boxed, sheet-metal housing, the Type ETH, front of enclosure has been split to permit access to terminals for fast wiring changes. Other changes include slide-out chassis with plug-in tube and condenser. The electronic timer will control timed operations between 60 milliseconds and 60 sec, and is adjustable to any fraction of this range. It has accessible terminals, isolated load contacts, and a large, easy-to-read dial, and is available in 115-v a-c 60-cycle; 220-v a-c, 60-cycle. Bulletin ET-600 gives more details. General Control Co.

## 16—ACOUSTIC BARRIER cuts sound transmission

For use with suspended acoustical ceilings and intermediate partitions, this sound transmission barrier is composed of long, thin resilient glass fibers with a 2½-lb density. The barrier is cut ¾ in. oversize so that it must be compressed that much for insertion into company's Type D panel hat section. When released inside the hat section, they act as though spring loaded and attempt to revert to normal size. Friction between barrier and interior of the panel holds the barrier in place. According to manufacturer, this barrier reduces appreciably the amount of sound that penetrates the panel and would, ordinarily, be transmitted over the intermediate partition into the next room. Fenestra, Inc.

## 18—DRUM RACK affords efficient storage space

Unusually space-saving, the Rak-A-Tier Drum Rack can hold eight drums. It is 10-ft, 2-in. long, 3-ft 4-in. high and 3-ft deep. It costs around $80.00. Artco Corp.

## 19—FHP MOTORS are smaller and lighter in weight

Capacitor-start and split-phase motors in rigid and resilient base models are announced in NEMA 48 frame size. Through use of smaller, lightweight steel frames and cast aluminum endplates, weights of 1/6, 1/4 and 1/3 hp ratings have been reduced from 3 to 8 lb, manufacturer notes. A new lubrication system is designed to permit mounting sleeve bearing motors at any angle with positive lubrication. Wagner Electric Corp.

## 20—COMPUTING DEVICE for pneumatic measurement

The Sorteberg Force Bridge is a computing device designed for use in pneumatic measurement or control circuits for a variety of purposes. Manufacturer says it can convert a transmitted signal from a square root flow transmitter into a linear signal, permitting use of a flow receiver with an evenly graduated chart; it can be used to maintain a ratio between two pneumatic signals for flow ratio control; and it can also be used to multiply, subtract, divide or square pneumatic outputs, or to provide pressure and temperature compensation for transmitted flow signals. The design of the device assures friction-free operation, company notes, by the use of the feedback principle in a weighbeam and fulcrum system. Principal components are of plug-in construction, housed in a rugged, die-cast case. Minneapolis-Honeywell Regulator Co.

## 17—GUN-APPLIED COMPOUND self-cures into tough gasket

N-99 Self-Curing Neoprene Compound is designed to be flowed onto bolted or riveted flanges and lapped metal sheets to seal against air, dirt, oil corrosive fumes and liquids. The material gradually cures into a tough, elastic gasket, providing a permanent weatherproof seal. It is suggested for air, fume, and heating ducts, as well as prefab metal buildings. This sealing compound is available in cardboard cartridges for application by hand or with special air operated guns. Gates Engineering Co.

## 21—GAS ENGINES power air conditioning systems

Natural gas engines developed to power central air conditioning equipment are announced as offering savings up to 50 per cent in operating costs. Also, additional savings are possible with these engines where lower gas rates are available during the summer months. The engines are designed to provide low cost air conditioning of 75- to 500-ton size units; they range in size from 75 to 500 hp and can be purchased in multiple units, and they can be installed in new or renovated buildings. Reports of an initial installation of these engines are cited to show worthwhile savings in operating costs, which more than offset the slightly higher installation and maintenance costs as compared to electrically powered equipment. A further advantage noted is that a well designed engine installation can be made to operate at various speeds, instead of an off-on operation. LeRoi Div., Westinghouse Air Brake Co.

## 22—STACKING BASKETS for handling the bulk parts

Eezy-Stak Baskets are fabricated of flat expanded metal (¼ or ½ in.) on welded wire frames. They are of open mesh construction for quick drainage and easy cleaning, and have a zinc-plated, rust-resistant finish. An interlock handle enables convenient stacking and compact parts storage. Inside dimensions of baskets are 12- by 20-by-5½ in. Wire & Iron Products, Inc.

## 23—EMERGENCY LIGHT works automatically

Because of an automatic charging device, the Model A Exide Lightguard can provide increased protection against lighting failures, says manufacturer. The unit is designed not only to operate automatically during a power failure, but also to prepare itself for the next blackout. Immediately following an emergency discharge, it recharges its storage battery at a high rate, company explains, and at the end of the high-rate charge, the Lightguard returns the battery to a trickle-rate to maintain itself in a state of constant readiness. A temperature-compensated thermal voltage-sensing relay is provided to eliminate need for a charge-rate switch requiring manual operation.

Requiring addition of water only once or twice a year, the battery of the unit has colored pilot balls which show approximate state of charge. Standard Model A Exide Lightguards have one 25-w sealed beam lamp mounted on the steel case of the self-contained unit. An additional lamp can be mounted on the



For more facts circle 594 on Reply Card——→

## AB-I's eliminate the replacement nuisance?

**FOREVER.** And in many cases Westinghouse AB-I circuit breakers actually cost less than safety switches.

A flip of the handle restores power immediately after faults. With nothing to replace there is no time delay, no maintenance expense. There is no stock of replaceable devices to maintain—tying up valuable floor space. No need for capital investment to acquire such a stock.

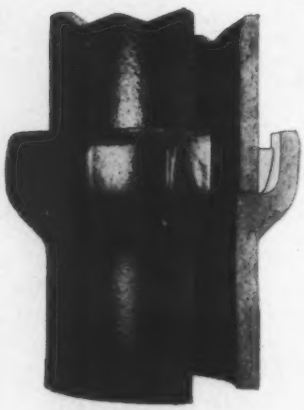
Westinghouse unit breakers and enclosures are sold separately, for your convenience. Buy and install them as desired.

AB-I circuit breakers are the modern successor to the fused switch. Can you afford *not* to use Westinghouse AB-I circuit breakers? For further information ask your Westinghouse distributor for Descriptive Bulletin 30-250 or write Westinghouse, P. O. Box 868, Pittsburgh 30, Pa. J-30225

YOU CAN BE SURE... IF IT'S

# Westinghouse

# Infiltration-proof AMVIT* JOINTED CLAY PIPE gives you *lowest cost of sewer line in place*



## Longer, stronger pipe with plastic mechanical joint speeds installation, saves labor

Amvit Jointed Clay pipe produces professional results with minimum effort. The joint is on the pipe, delivered to the job ready to use. No other materials such as caulking, joint compound, hot-pots, or ladles are needed to make the Amvit Joint. It takes just a few seconds to push the pipe together and the line is complete.

Field tests on the more than 60 installations completed show that Amvit prevents ground water infiltration. This results in sizable savings in both pumping and treatment plant costs. Amvit is a compression type joint on the ball and socket principle. Nothing can enter the line after it is complete.

Amvit Jointed Clay pipe, in sizes 4" through 24", together with all fittings is available for immediate delivery in the Northeast and Central States.

For more information, write or call American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you.

*The Amvit Joint is made of a plastic material with rubber-like characteristics. Like the pipe, the joint will withstand the most severe underground conditions. Amvit Joint is furnished on all fittings.*

SINCE 1900

AMERICAN

**American Vitrified Products Company**

CLEVELAND, OHIO

*T. M. Registered. Patents Pending

**Plants Across the Nation**... Brazil, Indiana • Chicago, Illinois • Cleveland, Ohio • Crawfordsville, Indiana • Detroit, Michigan • East Liverpool, Ohio Fenton, Michigan • Grand Ledge, Michigan • Lisbon, Ohio • Los Angeles, California • Milwaukee, Wisconsin • South Bend, Indiana • Uhrichsville, Ohio

**For more facts circle 595 on Reply Card**

# NEW PRODUCTS

(Begins on page 170)

case, or two additional ones can be connected remotely. Up to three lamps can be powered by the unit. For installation on posts or walls, this unit is available as auxiliary lighting equipment for plug-in connection to 115-v 60-cycle a-c source. Exide Industrial Div., The Electric Storage Battery Co.

## 24—pH METER is pocket-size, easy to operate

The Pocket pH Meter is a battery operated instrument having a range of 2 to 12 pH. The single electrode combines both reference and glass electrodes. The instrument also has a "memory" dial for use in standardizing. It operates from simple batteries similar to those used in flashlights. Scientific Instruments Div., Beckman Instruments, Inc.

**To receive product data circle item numbers on the handy Reader Service Cards provided on pages 219-220.**

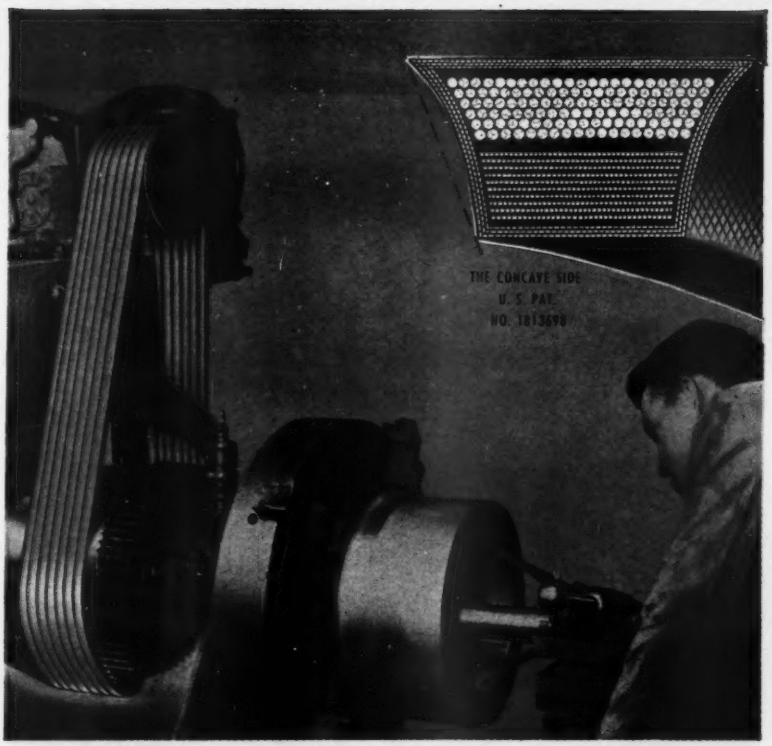
## 25—ENCLOSURE for making phone calls in noisy office

This general acoustical enclosure is said to provide an "isle of quiet" in the

noisiest office. The enclosure is made of steel and employs the same sound absorbing material used in the company's Hear-Here Acousti-Booths. Architectural Products Div., Burgess-Manning Co.

## 26—MECHANICAL SEAL for boiler feed pumps

This boiler feed pump mechanical seal is claimed to need no further attention and replacement of sleeves once installed. According to company, loss of feed water is prevented, since there is no leakage, and long seal life is obtained through the use of a special closed circulating system which provides cool water in sealing chamber assuring best seal performance. The seal comes engineered for the particular operation, in-


# WHY you get more service from V-Belts with concave sides

Each sidewall of a Gates V-belt is concave (Fig. 1) — a precisely engineered curve that makes V-belts last far longer.

Fig. 1

Fig. 1-A

**HERE'S WHY:** on the bend around the sheave, the concave sides of a Gates V-belt fill out and become straight (Fig. 1-A). Thus the belt makes full contact with the sides of the sheave, grips the sheave *evenly*.

This even contact distributes wear uniformly across the sides of the belt. Uniform wear lengthens belt life; keeps costs down.

**MAKE THIS SIMPLE TEST**

Fig. 2

Fig. 2-A

Bend a straight-sided belt (Fig. 2). The sides bulge at the bend causing uneven contact in the sheave groove (Fig. 2-A). Naturally, wear is greater at points indicated by arrows. Result: shorter belt life, increased belt costs.

To cut down-time and V-belt replacement costs, specify belts that grip evenly and wear longer. Specify Gates Vulco Rope — the V-belt with concave sides. The Gates Rubber Co., Denver, Colorado — *World's Largest Maker of V-Belts.*

*There are Gates Engineering Offices and Distributor Stocks in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.*

TPA 109A

Gates

# Gates Vulco Rope Drives

For more facts circle 596 on Reply Card

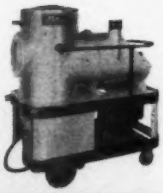
HOW SPENCER VACUUM SERVES INDUSTRY

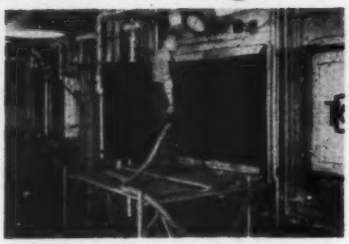
With permanently installed systems piped throughout the plant . . . with rugged, reliable portables . . . Spencer Vacuum is industry's modern "tool of many uses".

FLOOR CLEANING

Maintenance is speeded, sanitation improved when high suction Spencer vacuum is on the job. Special applications reduce plant operating overhead, too. Vacuum cleaning of boiler tubes and furnaces, for example, increases operating efficiency up to 20%.

CLEANING





BOILER CLEANING

CONVEYING

Rapid, sanitary handling of dry and free flowing materials in granular or pulverized form is accomplished with Spencer vacuum. Units from 2 through 100 HP, capacities up to 10 tons per hour.

SPEEDING PRODUCTION

BENCH WORK

Reclaiming materials manually or automatically . . . vacuum chucking . . . removing chips, threads or bristles . . . aiding automation on assembly lines . . . these are just a few production-speeding applications of Spencer Vacuum.

REQUEST CATALOG 155.

SPENCER HARTFORD

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

For more facts circle 597 on Reply Card

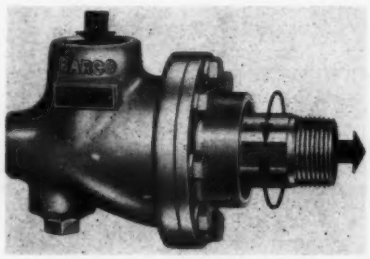
# NEW PRODUCTS

(Begins on page 170)

cluding adaptation to pump design and piping arrangement. Plans and all necessary recommendations are supplied and heat exchanger size is specified, to provide a complete package that can be easily installed without major stuffing box alteration. Crane Packing Co.

## 27—ROTARY JOINT has wide range of service

Designated Type C, this new rotary joint is designed to simplify selection specifications by being almost universally suitable for pressures from 0 to 200 psi, steam, or to 400 psi, hydraulic; for temperatures to 450 F, or special to 500 F; and for any ordinary rotating speed. The



compact joint is suitable for use on steam, air, water, oil, gas, or alternating hot and cold service, manufacturer announces; and for single flow or two-way syphon flow installation. It comes in eight standard sizes from ½ to 3 in.

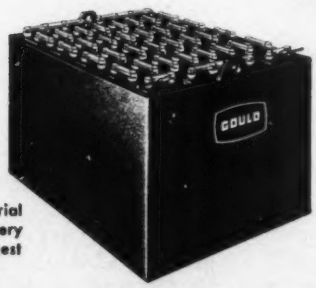
Type C Joints are characterized by low starting and running torque, even at high pressures, it is pointed out; thus, power requirements are low. Bearings and seal are self-lubricating and the seal is self-adjusting for wear. Overall lengths range from 5⅞ to 12¾ in. Body construction is malleable iron with heat treated steel rotating shaft. Joints may be had with right-hand or left-hand thread on the rotating shaft. Catalog 310 gives data. Barco Mfg. Co.

## 28—RE-RATED MOTORS offer several improvements

Six advantages are announced for this company's Series 254U Motors, re-rated to conform with new NEMA requirements. Foremost of these is the elimination of "hot spots" through straight-through dual sweep ventilation. Tandem fans, one pushing and one pulling, produce a washing action over the field coil ends to assure lower temperatures. A second feature is the use of Mylar, laminated to rag paper, as slot cell insulation. Easy bearing inspection is provided for by means of removable cover plates on each end-head to permit inspection without dismantling the motor. Installation and maintenance are simplified through permanently-numbered leads. Full-height end-head protection is provided by one-piece, shrouded end heads, and internal

# STOP... no need to be "up-in-the-air" about batteries.

**Consider why other people buy Gould Batteries:**




Gould Industrial Truck Battery —America's Finest

More aggressive research program.
More application engineering help.
More and better battery performance.

Sounds sensible, doesn't it? Try us and see.
Gould-National Batteries, Inc., Trenton 7, N. J.

*More Power to you from Gould*

**gould BATTERIES**

*Always Use Gould-National Automobile and Truck Batteries*

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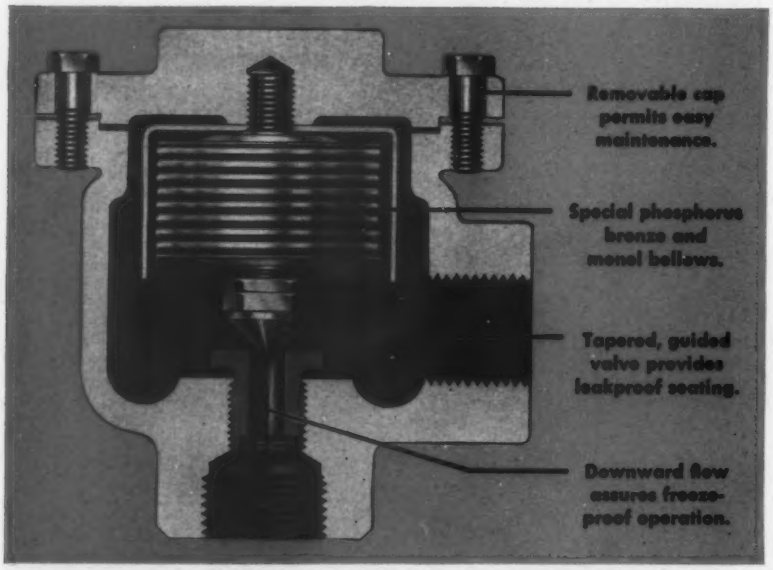
**For more facts circle 598 on Reply Card**

ANDERSON PRESENTS...

THE GREATEST ACHIEVEMENT IN INDUSTRIAL THERMOSTATIC STEAM TRAPS


Removable cap permits easy maintenance.
Special phosphorus bronze and monel bellows.
Tapered, guided valve provides leakproof seating.
Downward flow assures freeze-proof operation.

NEW QUIK-FLEX

THERMOSTATIC STEAM TRAPS WITH THE FREEZE-PROOF GUARANTEE!

● Entirely new in design and engineering, here is one of the greatest achievements of all time in industrial thermostatic traps. Anderson's trap designers have engineered a trap that can be *guaranteed freeze-proof*—used with utmost safety in any outdoor or open-sided building installation. In addition, they are made with Anderloy valve and seat designed especially to resist scoring! Specify freeze-proof Quik-Flex Thermostatic Steam Traps.

THE V. D. ANDERSON COMPANY
Division of International Basic Economy Corporation • 1939 West 96th Street, Cleveland 2, Ohio

Please send Bulletin 257 describing your new Quik-Flex Thermostatic Steam Trap with the Freeze-Proof guarantee.

*Name* _____

*Company* _____

*Address* _____

*City* _____ *Zone* ____ *State* _____

QUALITY STEAM TRAPS SINCE 1886

For more facts circle 599 on Reply Card


# NEW PRODUCTS

(Begins on page 176)

baffles complete the splash-proof construction. Also, factory-installed end-head screens are included at no extra cost, says manufacturer, and even with the screens in place you get a 40 C rise motor. Robbins & Myers, Inc.

## 29—HARDNESS TESTER is automatic, console type

With this unit it is claimed possible to automatically classify up to 1000 Rockwell tests per hour on production runs by hand-feeding individual pieces. Designated the Size 3, this console model hardness tester performs basically on the same principle as manufacturer's hand operated units. It tests any metal on the regular Rockwell scale, such as A, B, C, D, E, F, G, H and K. It is designed

to automatically classify tested work pieces into one of three categories—correct, too hard or too soft. It has controlled hardness limits as close as two Rockwell numbers, has an automatic counter and automatic safety stop.

Work pieces may be tested in two ways: manual feed and manual disposal; and semi-automatic, with manual loading and automatic disposal, and classification as to hardness. The cycle may be readily changed from continuous to single operation for making individual tests. As each piece is tested, one of three lights on the tester indicates hardness classification—red for too hard; green for correct hardness; and yellow for too soft. Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc.

## 30—RESET DROP provides continuous warning

Constantly Ringing Reset Drop 26 is designed particularly for alarm systems where immediate attention is required for protection of personnel and equipment, and where reset feature is needed for restoration of alarm system. It is said to be particularly suited for many types of industrial control systems and annunciators. It operates in the low voltage circuit that may be supervised by thermal, liquid level, tachometer

For more facts circle 600 on Reply Card

Horne's main store in Pittsburgh has 28 filter stations with banks ranging from 10 to 48 filters each. Pittsburgh Glasfloss Filters are used exclusively. The system was installed in 1937.

Howard F. Burrell, Chief Engineer, reports that Pittsburgh Glasfloss Filters are easy to handle, soft and light weight; and that this Fiber Glass filter does not splinter or shred.

# "We effected a direct unit saving of 13% by switching to Pittsburgh Glasfloss Air Filters"

—says Howard F. Burrell, Chief Engineer
JOSEPH HORNE CO., Pittsburgh, Pa.

"The filters we previously used in our store-wide air conditioning system would shred and stick to fingers and clothing when handled," reports Mr. Burrell. "They were not uniform in quality and their performance was erratic.

"We switched to Pittsburgh Glasfloss Filters in February, 1956. We found Glasfloss Filters much easier to handle. They are lighter in weight and safer, too; this Fiber Glass does not splinter or shred. What's more, Glasfloss lasts longer, making it possible for us to effect a 13% saving over filters previously used.

"From an engineering point of view, we consider Glasfloss the most practical, economical and dependable filter possible to obtain for our system!"

### Glasfloss Filters Will Give You Best Results, Too!

Pittsburgh Glasfloss Filters are made of fine, soft Fiber Glass, which provides greater dust-collecting areas without interfering with the air flow. They are moisture proof and fire resistant. Glasfloss Filters will give you top service from your air conditioning system, help you cut costs.

Contact your nearest Glasfloss Distributor or Pittsburgh Plate Glass Warehouse. *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.*

**PITTSBURGH GLASFLOSS FILTERS ARE A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY**

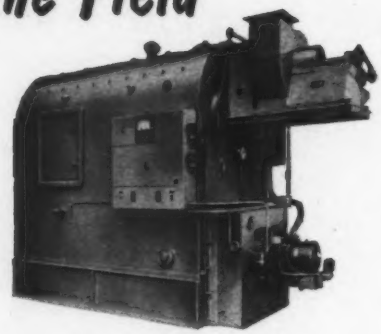
Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia and St. Louis

FIBER GLASS

**PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS**

PITTSBURGH PLATE GLASS COMPANY

# Compare International Water Tube Package Boilers with the Field



- Ample Furnace Volume—low heat release rates
- Convertible to Coal Firing
- Reserve Capacity Always Available
- Rapid Directed Water Circulation
- Maximum Heat Absorption—quick steaming
- Induced Draft—quiet operation
- Fully Coordinated—fire tested
- Oil, Gas or Combination Firing

*Package boilers can also be shipped, less burner and controls, for installation by local contractors in accordance with International's standard package specifications.*

## and You Will Specify INTERNATIONAL WATER TUBE HEATING and POWER BOILERS

It will pay you to specify International, the boilers with extra profits built in. We will gladly send these International Bulletins:

No. 600 —Water Tube Package Units
No. 200 & 500—Water Tube Heating Boilers
No. 300 & 400—Water Tube Power Boilers

**1886-1956**

THE INTERNATIONAL BOILER WORKS CO.

Steel Firebox Heating & Power Boilers • Low & High Pressure Water Tube Package Boilers • International-LaMont Forced Recirculation Generators • ASME Code Pressure Vessels & Welded Products.

820 Spruce St. East Stroudsburg, Pa.

For more facts circle 601 on Reply Card


# NEW PRODUCTS

(Begins on page 170)

switch, voltage or current relay, or other device sensitive to specific conditions. When controlled condition is returned to normal, warning devices can be silenced or cut out by a reset button under the drop. The drop will recycle with return of alarm conditions. Drop is supplied for 6-8 v d-c or 8-12 v a-c circuits. Edwards Co., Inc.

## 31—INSULATION COATING can be painted on

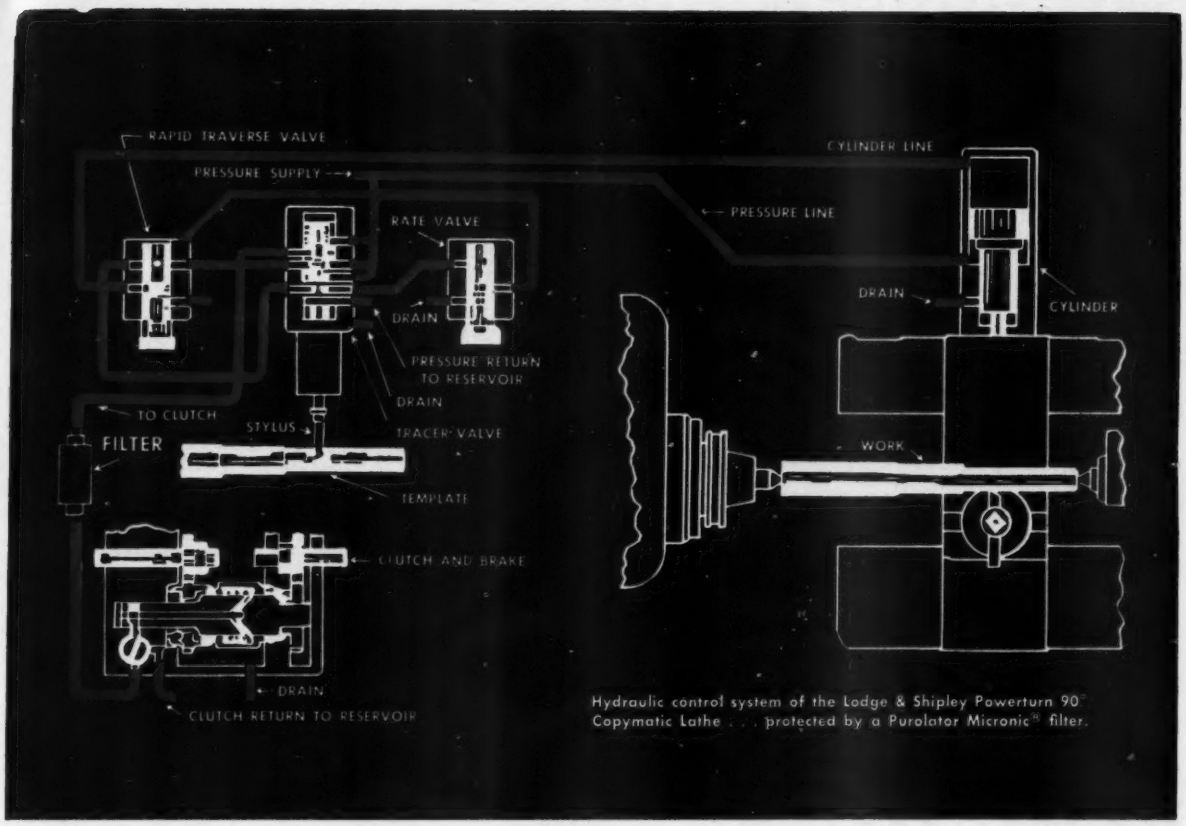
No-Short is announced as an insulation coating having a dielectric constant of 7.5 at 1000 cycles. It can be painted on and dries overnight to a firm, chip-proof, abrasion resistant coat, says company, which is resistant to acids and unaffected by heat up to 550 F (Class H). It is also claimed non-toxic and non-allergy producing. Used primarily on electrodes, holders, seam welding wheels, and arms, the material is a factor in reducing shorts in resistance welding and is suggested for other electrical insulation where superior bonding and wearing characteristics are needed. Lovell Chemical Co.

## 32—RACEWAY SYSTEM lies flush with the floor

Primarily for modernizing existing buildings, Flushduct is installed by trenching the existing floor so the ducts can be installed flush with the surface of the floor. Linoleum or other top surface materials are then laid directly over the duct system. Like company's standard Nepcoduct, the ducts come in 10-ft lengths with outlets spaced every 24 in. along the duct and each outlet closed with a brass cover plate. Flushduct is available in single-, two-, or three-duct systems; the latter two are welded together. Generally, standard Nepcoduct elbows and fittings comprise the system components. National Electric Products Corp.

## 33—INSTRUMENT shows levels in faraway tanks

Called a capactiy telemeter, this remote control electronic device can be connected by coaxial cable to a control position as far as 4000 ft—more than ¾ mile—away. Its accuracy in gaging the contents of a tank is claimed unaffected by changes in weather conditions or electrical properties of the cable. Developed for chemical and manufacturing plants




Hydraulic control system of the Lodge & Shipley Powerturn 90° Copymatic Lathe . . . protected by a Purolator Micronic® filter.

# Designed for highly accurate control ...fully protected by Purolator Filtration

On a very successful automatic duplicating lathe, this hydraulic control system makes possible both quick, simple operation and a high degree of sensitivity and accuracy. Reliable and uninterrupted operation of a system like this is dependent upon freedom from contaminants. That's why the Lodge and Shipley Company, its manufacturer, made Purolator Micronic® filters an integral part of their hydraulic system.

Purolator engineers recommended a standard filter from their stock of over 2000 models. It more than met the system's special requirements.

The controlled porosity of Purolator's Micronic element evenly filters out contaminant particles as small as .000039 inch. And because it's made of plastic-impregnated cellulose, the Micronic element is not affected by high temperatures, water, or oil.

*FILTRATION FOR EVERY KNOWN FLUID*

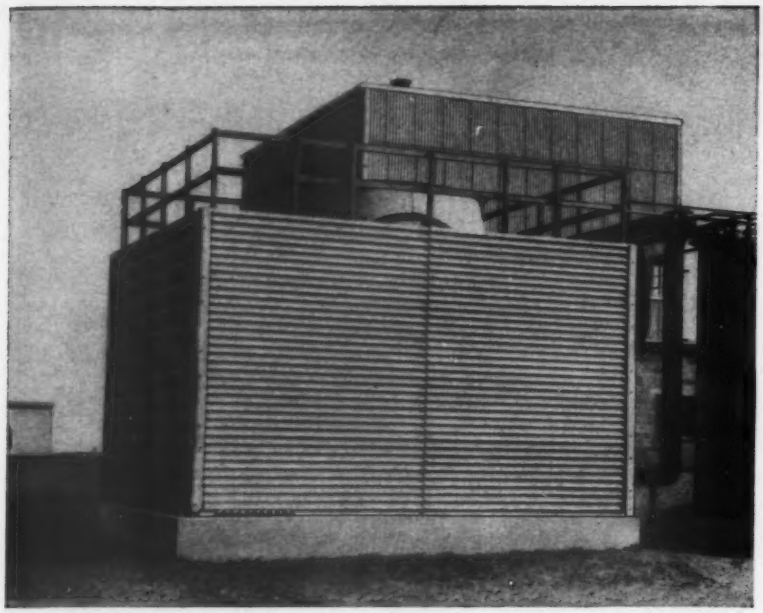
**PUROLATOR**

**PRODUCTS, INC.**

Rahway, New Jersey and Toronto, Ontario, Canada

**Filtering information for product designers is available in our 32 page "Filtration Manual for Product Designers". Just enclose 25¢ to cover postage and handling. Address Dept. P5-14.**

**For more facts circle 602 on Reply Card**



*Plant Engineers "Discover" the*

# Marley Double-Flow Aquatower*

**Ask a progressive plant engineer what intermediate-capacity cooling tower offers every performance and maintenance advantage of large industrial towers, and chances are 9 to 1 he'll say, "Marley's Double-Flow Aquatower"! This tower that combines big-tower performance with small-tower compactness is today "the hottest thing in cooling" for industrial services involving intermediate-gallonages.**

**Only the Double-Flow Aquatower gives you the many plus-performance features developed for huge Marley industrial towers—open distribution . . . extra-rugged structure . . . more-than-adequate fill, drift eliminators, and fan cylinders . . . Marley-designed fans and Geareducers . . . easy-access maintenance. And this complete cooling tower is a streamlined, space-saving unit for it is the *original low-silhouette* tower.**

**There just isn't anything like the Double-Flow Aquatower, and if you haven't yet "discovered" it, get in touch with your Marley Application Engineer in any of 55 cities. He'll show you the complete line in wood or steel structure with asbestos cement board casing, in single or multi-cell units. *Call him today or —***

*WRITE FOR BULLETIN DFAQ*

*Reg. Trademark

MARLEY **The Marley Company**

Kansas City, Missouri

**For more facts circle 603 on Reply Card**

# NEW PRODUCTS

(Begins on page 170)

and refineries having materials stored in tanks and bins scattered over a sizable area, this instrument is also reported economically feasible for some single tank installations, particularly in hard-to-measure situations. The complete capacity telemeter system consists of a measuring unit, a remote probe unit for each tank, and indicator. Fielden Instrument Div., Robertshaw-Fulton Controls Co.

**More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 219-220.**

## 34—MAGNETIC CONTROL for tube expanding

Operation of this air magnetic control is based on a powerful permanent magnet designed to give positive and instantaneous engagement and disengagement between driving mechanism and driven expander. Control is air-driven and described as ideal for rolling tubes in hazardous locations. A single compact unit

(weight 10 lb, length 10-½ in.), it is well balanced for ease in handling. One of the features announced is a sensitive, easily adjusted calibrating dial that permits exact settings for torque control. A positive drive action stops instantaneously when preset torque is reached. Then, after disengagement of expander, motor runs free, cutting number of required stops in half. An on-off locking switch and separate reversing trigger permit uninterrupted sequence of operation, and a quick-release chuck serves to lock expander securely yet allows snap motion insertion or removal. Control comes in a fitted metal case that holds unit and expanders. It operates on 28 to 30 cfm of air at 90 psig. A single ⅜ in. air hose is the only connection required. Lagonda Div., Elliott Co.

## 35—FUEL OIL HEATERS are improved, safety type

Paracoil Thermofilm Fuel Oil Heaters are announced as safety-type units featuring 100 per cent counterflow, a safety barrier of heat transfer liquid between oil and water, and no electric warning system. The heaters are claimed to deliver more gallons per hour at rated oil



**For more facts circle 604 on Reply Card**

# Need a Limit Switch?

# WHAT'LL YOU HAVE?

Here are samples of A-B quality limit switches—a line so complete it will satisfy your every requirement!

## OILTIGHT

Bulletin 802T—For high-speed production machines. Sealed to protect the switch against oil and coolants.

## GENERAL PURPOSE

Bulletin 801—Standard or heavy-duty rating, with roller, push type, or fork lever action, and slow or snap action contacts.

Bulletin 803 Cam Limit Switch used on rotating machines to open and close circuits at any desired angular position.

## PRECISION

Bulletin 802—For applications where mounting space is small and operating motion is measured in thousandths of an inch.

1-57-MR

**ALLEN-BRADLEY**

QUALITY

MOTOR CONTROL

A-B Quality

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

# PILOT CONTROLS?

## Yes... Allen-Bradley covers the field!

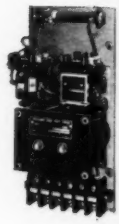
No matter what your needs for pilot control devices may be . . . refer to the new Allen-Bradley "handy" catalog . . . you will usually find what you are looking for. If not, please write Milwaukee, or contact your nearest Allen-Bradley representative.

All pilot controls are made to Allen-Bradley standards of quality. All of them have silver alloy contacts that require no service attention. You'll find it saves service time and money to specify Allen-Bradley.

PHASE FAILURE AND PHASE REVERSAL RELAYS

**BULLETIN 812**

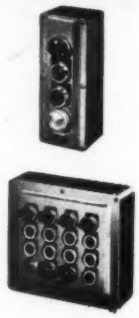
Style A disconnects motor if one phase of power circuit fails. Style B protects against phase reversal, as well.



OILTIGHT PUSH BUTTON STATIONS

**BULLETIN 800T**

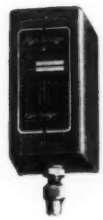
For machine tool applications, to keep oil away from the contacts. Available in flush, surface, or pendant mounting.



PRESSURE CONTROLS

**BULLETIN 836**

For noncorrosive liquids, vapors, gases, from 30 in. of vacuum to 700 psi. Accurate, rugged, compact, and attractive appearing.



PLUGGING SWITCHES

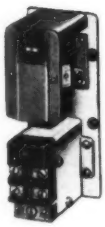
**BULLETIN 808P**

Used with a simple reversing switch, it provides quick, automatic stopping of machines driven by squirrel cage motors.

TIMING RELAYS

**BULLETIN 849**

A reliable and accurate pneumatic timer with a range of 1/6 to 180 seconds. Many arrangements. Motor driven, electronic and oil dashpot timers also available.



TEMPERATURE CONTROLS

**BULLETIN 837**

For temperatures from −45°F to 440°F. Metal bellows operates snap action precision switch with pure silver contacts.

FOOT SWITCHES

**BULLETIN 805**

For operating punch presses, riveting, welding, and many other machines. Switch has snap acting, normally open and normally closed silver alloy contacts.

ZERO SPEED SWITCHES

**BULLETIN 808**

A plugging switch that brings squirrel cage motors to zero speed quickly, without any reversal of direction.

FLOAT SWITCHES

**BULLETIN 840**

Provide automatic control for motors operating tank or sump pumps.

PRESSURE SWITCHES

**BULLETIN 830**

For domestic water pumps, and commercial and industrial air compressors.

ROTARY SWITCHES

**BULLETIN 806**

Cam operated switches for the selection or transfer of various control circuits. Silver alloy contacts.

1-57-MR

A-B Quality

# ALLEN-BRADLEY

## MOTOR CONTROL

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

Send for the new 7th Edition of the Allen-Bradley Handy Catalog. It is a veritable encyclopedia of reliable motor control.

*how the package*

# LJUNGSTROM® AIR PREHEATER

## boosts small boiler performance . . .

**Advantages of**
**The Package Ljungstrom Air Preheater**

1. Reduces fuel consumption . . . even permits use of low grade fuels.
2. Increases boiler output and reliability.
3. Eliminates cold spots . . . keeps corrosion to a minimum.
4. Easy, fast to clean and maintain.
5. Comes fully assembled—ready to install.

The new, completely *shop-assembled* Package Ljungstrom Air Preheater means that boilers as small as 25,000 pounds of steam per hour can have the advantages of regenerative preheating using the same principle of heat recovery used by large, efficiency-minded utilities.

Here's what the Package Ljungstrom does for you: (1) It saves fuel—roughly 1% for every 45-50 F air preheat. (2) It boosts boiler output and efficiency substantially. (3) Ljungstrom permits use of lower grade fuels. All of which means better performance at lower cost. For more detailed information — get in touch with The Air Preheater Corporation, today. Free brochure on request.

**The Air Preheater Corporation** 60 East 42nd Street, New York 17, N. Y.

**For more facts circle 605 on Reply Card**

# are your slings safe?

This 24-ton heat exchanger, made by the Texas Metal Fabricating Company, is shown being lifted by Wickwire 3/8" Multiflex Type 1 Single Leg Slings—one of many types of Wickwire Slings which are serving American industry today.

One faulty sling can play havoc with your crews, your equipment, the materials they handle and your pocketbook. That's why it is so important for you to make absolutely sure of the quality of the slings you use . . . why we believe that Wickwire Slings are your safest buy.

You see, we control the quality of the steel that goes into Wickwire Slings by carefully making our own. From this steel, we make our own rods and, from these rods, our own wire. Then, our own wire rope. And, finally, we make our own wire rope into Wickwire Slings. Every step is handled right in our own plants. *This enables us to completely test our product throughout every stage of its production . . . and it's your assurance of the safest sling possible.*

It's a mighty good reason why SAFETY DEMANDS THAT YOU GET THE WICKWIRE STORY TODAY. For complete details, contact the nearest sales office listed below.

CF&I **WICKWIRE**
**WIRE ROPE SLINGS**
PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

THE COLORADO FUEL AND IRON CORPORATION—Denver • Houston • Odessa (Tex.) • Phoenix Salt Lake City • Tulsa
PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit Emlenton (Pa.) • New Orleans • New York • Philadelphia
CF&I OFFICES IN CANADA: Montreal • Toronto 4472

For more facts circle 606 on Reply Card


# NEW PRODUCTS

(Begins on page 170)

exit temperature, within a given temperature range, than comparable fuel oil heaters. Use of extended surface on heating tubes and straight tube construction, oil in shell, water in tubes, providing high counterflow, contribute to improved heat exchange, it is noted. The heaters come in five sizes, and installation costs are said to be reduced because of smaller size, reduced weight and absence of electrical wiring. Catalog 60-N gives details. Davis Engineering Corp.

## 36—SMALL PARTS FEEDER speeds assembly work

Developed as a result of methods research conducted in conjunction with appliance manufacturers, the NesTier Model M is designed to cut assembly costs by making parts convenient to workers and easier to grasp. In use, these small parts assembly feeder units can be combined

to fit assembly requirements. Parts hoppers are mounted side-by-side and in various heights on a rack. All units are removable for reloading. Both curved and straight racks are available in varying sizes, but because the hoppers will stack on top of one another, use of rack is optional.

Priced lower than many assembly hoppers, these units offer several design advantages. They are tapered so as to form a natural arc when several units are placed side-by-side. A "stepped" insert in the hopper bottom serves to control rate of parts flow, and having an aluminized finish, this insert improves parts visibility inside the hopper. Units are steel with green baked enamel finish. Manufacturer points out that they have no sharp edges or corners. The Chas. Wm. Doepke Mfg. Co., Inc.

## 37—CUT-OFF SWITCH protects water systems

Gard-it is a low pressure cut-off switch for water system protection. It is designed to stop pump operation when water pressure falls below a safe, predetermined operating level. Rated at 1 hp, 110-220 v a-c, this switch is actuated by operating presure from pump. Gard-it operates on the principle that when pressure drops to 5 or 6 lb, contacts act to interrupt line voltage to pressure switch. stopping pump

Using

# DU PONT ELASTOMERS

NEOPRENE • HYPALON®

in Industry

## Products of colored HYPALON® stay bright despite severe exposure

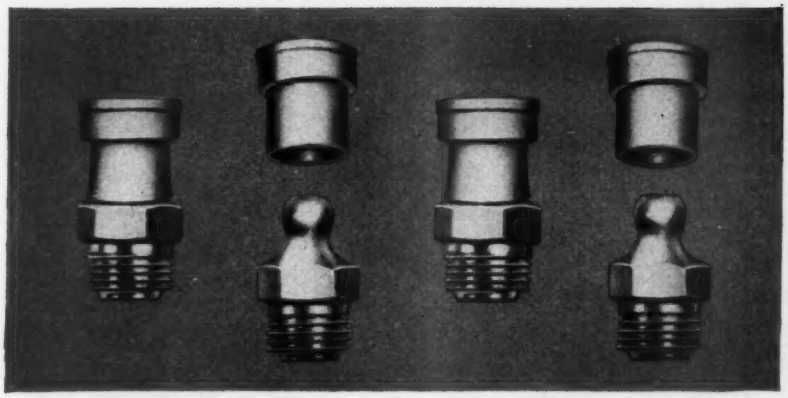
**TWO YEARS of outdoor exposure with virtually no trace of color failure, thanks to the superior color stability of HYPALON.**

HYPALON, Du Pont's new synthetic rubber, is best known for its exceptional resistance to heat, ozone and oxidizing chemicals. But another advantage is its color stability.

HYPALON can be compounded in a *complete range* of weather-resistant colors that keep their brightness despite severe indoor or outdoor service.

Rubber, wood, metal and masonry can be decorated as well as protected by coatings of HYPALON. Colorful compounds of HYPALON can also be used as the jacketing on heater cords, wire and cable where ozone may be a problem. Tarpaulins of HYPALON-coated fabrics can be made in any color and give excellent resistance to sun, weather and oxidizing chemicals.

The use of colored HYPALON in your plant can mean long-term economy. So when you need a resilient colored product that must have *exceptional* resistance to heat, ozone and oxidizing chemicals, remember HYPALON.



## NEOPRENE grease caps eliminate a main source of bearing failure

### Protect fittings from dirt

A midwestern manufacturer of lubricating caps has reported the development of snap-on caps made of neoprene, which are said to eliminate one of the main sources of bearing failure—the introduction of dirt into bearings at the time of greasing. Dirt ordinarily accumulates on the fittings and is forced into the bearing when it is greased. Capped fittings are protected from such dirt pickup, so there is no problem.

### Neoprene chosen over natural rubber, plastics, paper

During the development of the snap-on cap, natural rubber was ruled out because it swelled and stuck to the fitting when exposed to grease. The various plastic caps tested became slippery and fell off the fitting. Paper did not have the elasticity needed. Neoprene finally was chosen because it has the elasticity and resilience needed for the cap to stay on the fitting plus the resistance to grease to keep it from swelling and sticking.

### Color-coded fittings

Neoprene caps also come in a range of colors, which can be used to set up a lubrication schedule, to indicate the type of lubricant needed and to locate inaccessible fittings.

### Other properties and products of neoprene

Lubricating caps are just one example of how the properties of neoprene can be used in plant maintenance. In addition to its resistance to oil, neoprene also resists chemicals, heat, abrasion, weather and sunlight. It is the balanced combination of these properties that makes neoprene well suited for use in gaskets, hose, belts, coatings and many other products. For more information on how neoprene reduces maintenance and replacement costs, use the coupon below.

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REG. U. S. PAT. OFF.

**HYPALON** *is a registered trademark of E.I. du Pont de Nemours & Co. (Inc.)*

**BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY***

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*Improving wire rope service with* LESCHEN HKP *Red-Strand*

# How to prove wire rope performance for yourself

There is a difference in wire rope—in types, in constructions, in brands. And using the right rope every time can easily reduce rope costs by 10% to 20% or more.

How do you know which rope is right? First, get good advice. Leschen field men, distributors and Leschen's engineering department can help you make the best choice. Second, prove it out with easy-to-use Leschen Service-Score stickers. They tell you right on the job how you're doing—help you make accurate comparisons.

Keep the score—see the results—and you'll use more Red-Strand Wire Rope. See your Leschen man or write Leschen Wire Rope Division, H. K. Porter Company, Inc., St. Louis 12, Missouri.

Leschen engineering advice and Service-Score Stickers are yours for the asking. Write for fact-folder.

HKP LESCHEN WIRE ROPE DIVISION
H. K. PORTER COMPANY, INC.

For more facts circle 608 on Reply Card

# NEW PRODUCTS

(Begins on page 170)

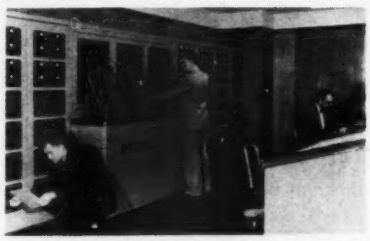
operation. Pumping is resumed by depressing reset button on the switch. Automatic operation continues as long as there is an adequate water supply to maintain normal operating pressure, it is stated. Gard-it incorporates two poles to break both lines to pressure switch in case low pressure cut-off is reached. More data in Bulletin 5613. Furnas Electric Co.

## 38—SAMPLING UNIT for boiler water analysis

Designed to prevent "flashing" when taking boiler water samples for water treatment analysis, this sampler is announced as suitable for boiler blowdown to 900 psi and 750 F. Its mounting bracket provides for installation on any control panel, and it may be installed in any position. The unit weighs 40 lb, is 4½ in. OD, 16 in. long, with cooling water connections ½ in. IPS. Sampler inlet and outlet are ¼ in. IPS. Standard cooling coil contains 30 ft of copper tubing. Rempe Co.

## 39—RENTAL SERVICE for network analyzer

The network analyzer illustrated is available to utilities and manufacturing plants for their use in making power system studies. Fast operation, accuracy and



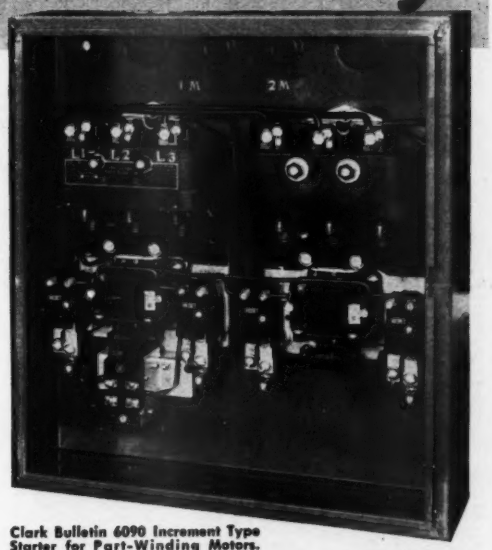
minimized advance preparation recommend this unit for completing complex problem solutions in a short time. Quiet, air-conditioned quarters, designed for the purpose, aid in efficient operation. The analyzer is announced as capable of simulating any electrical system which may be represented by 12 generators, 88 lines, 32 loads, 16 transformers and 150 buses. Company says the nominal per diem rental fee includes services of an operator and assistant. Location is downtown Philadelphia. I-T-E Circuit Breaker Co.

## 40—TANK LINER allows for thermal compensation

Announced as the first tank liner with built-in thermal compensation, the Expansion Tank Liner is constructed of Boltaron 6200, unplasticized polyvinyl chloride, Type I. It was designed to absorb the expansion and contraction of this rigid tank liner by movement of corrugations built into the individual sheets. According to manufacturer, these corrugations compensate the entire sheet in

# Two Outstanding CLARK CONTROLS for *"Cushioned" Motor Starting*

**CLARK Increment Starters** for Part-winding Motors and CLARK Reduced Voltage, Primary-resistor Type Starters are ideal for providing "cushioned" acceleration where requirements of the mechanical or electrical system indicate reduced torque-and-current starting. Both types offer the advantage of smoother acceleration and power application since the motor is not disconnected—eliminating mechanical and electrical shocks on the second step of acceleration. Both are available in sizes 1 through 7, with sizes 4 and smaller using the famous Clark Type "CY" starters which are setting new standards for dependability, low maintenance, and long life. Compact enclosures feature "safe-edge" design and generous wiring space.



Clark Bulletin 6090 Increment Type Starter for Part-Winding Motors. Integral Hinged Cover not shown.

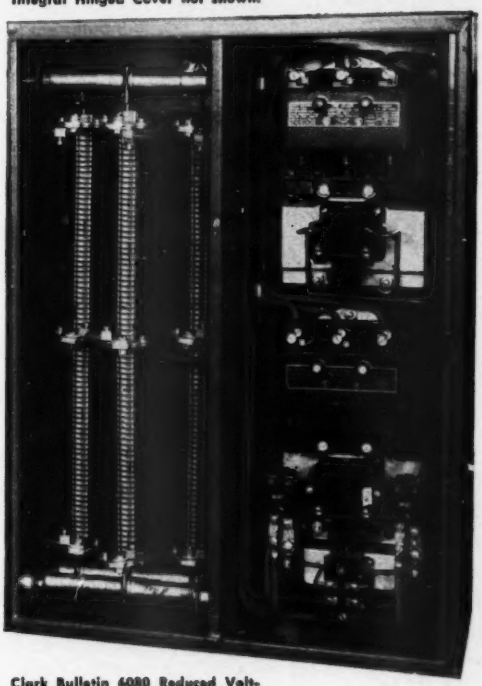
## CLARK INCREMENT STARTERS FOR PART-WINDING MOTORS

Where part-winding motors can be used, this starter offers definite economical advantages. Because it has no resistors and uses smaller size contactors, a single compact enclosure reduces space requirements, and the initial cost is low compared to other types.

## CLARK PRIMARY-RESISTOR TYPE REDUCED VOLTAGE STARTERS

This starter is applicable where higher starting torque is required. It offers greater flexibility of starting requirements and can be used on any squirrel-cage motor. It features the CLARK Edgewound non-breakable resistors—contactors and resistors are mounted in isolated compartments—where both are readily accessible.

*For complete information on Clark Controls for "Cushioned" Starting, contact your nearest Clark sales office or Clark distributor, or write us direct.*



Clark Bulletin 6080 Reduced Voltage Starter—Primary Resister Type. Integral Hinged Cover not shown.

*The* **CLARK CONTROLLER** *Company*

*Everything Under Control*

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For more facts circle 609 on Reply Card

# See What's New for *Your* Business

**at the**

*13th* INTERNATIONAL HEATING & AIR-CONDITIONING EXPOSITION

(formerly the International Heating & Ventilating Exposition)

**INTERNATIONAL AMPHITHEATRE—CHICAGO**

**FEBRUARY 25—MARCH 1, 1957**

Under the auspices of the American Society of Heating and Air-Conditioning Engineers, and in conjunction with their 63rd annual meeting.

**Plant engineers and factory managers must plan ahead to keep ahead. Today's best equipment is not good enough when you must improve on present performance and cut operating costs. To see and know how your best can become better, come to the largest exhibition of its type in the world. Come to Chicago, where more than 450 manufacturers will be showing and telling you about the newest heating, ventilating, and air conditioning equipment and installation methods. Talk to their technical representatives who will help to solve your problems.**

*To be sure you'll be there, write for advance registration to:*

**13th INTERNATIONAL HEATING & AIR-CONDITIONING EXPOSITION**

480 Lexington Avenue, New York 17, N.Y.

*Management:* International Exposition Co.

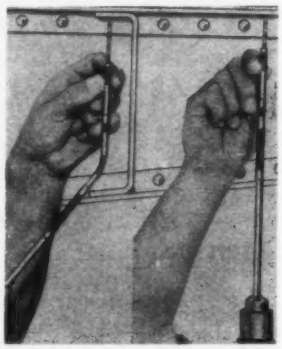
# NEW PRODUCTS

(Begins on page 170)

all directions and are capable of absorbing much more. The individual sheet (30-by-60-by-3/16 in.) allows lining tanks of almost unlimited size, it is stated, since expansion and contraction is confined to the individual sheet. Buckling, warping and other distortion are claimed to be virtually eliminated. The sheet can be used with tanks of wood, concrete, new or even corroded metal, or practically any other material, says company, and it can be used in any size tank, square or rectangular. Bulletin 4-EL gives details. H. N. Hartwell & Son, Inc.

## 41—DRILL EXTENSION provides rigid or flexible tool

A two-in-one drilling tool is afforded by the Little Beaver Drill Extension, 600 series. A flick of the finger converts it from a rigid to flexible drill extension, without shutting off the power—



the changeover being done by sliding the locking sleeve to either position. This extension adds 10 or more inches to standard length drills, and assembles quickly, says manufacturer, and it supplants the need for a varied inventory of special drills and extension rods. It is designed to accommodate over 52 regular drill sizes with corresponding chucks available in numerical sizes from No. 52 to 10, and in fractional sizes from 1/16 to 3/16 in. by 64ths. Bulletin 600 and price list give details. Beaver Tool Co.

## 42—STORAGE BATTERIES are compact, long-lived

Ranging in sizes smaller than a cigarette lighter and from ½ to over 150 amp-hr capacity, these miniaturized nickel cadmium sintered plate storage batteries are said to provide exceptionally high instantaneous currents. They are reported valuable for switch tripping and closing, particularly in compact, unattended substations and in severe climatic conditions. Claimed virtually indestructible these batteries are designed to deliver momentary discharge currents as high as 25 times rated amp-hr capacity. They are capable of repeated cycle service and have useful capacity in -40 to 165 F tem-

# want a nearby source?

If you do, you'll like the service you get at any of Crucible's nearby warehouses. Special steels of all types, sizes, and grades are in good supply. And service is speedy and dependable.

One good reason is that Crucible is *large enough to serve you—small enough to want to.*

*Stocks maintained of:*
*Rex High Speed Steel . . . ALL grades of Tool Steel (including Die Casting Die and Plastic Mold Steel, Drill Rod, Tool Bits, and Hollow Tool Steel Bars) . . . Stainless Steel (Sheets, Bars, Wire, Billets, Electrodes) . . . Max-el, HY-Tuf, AISI Alloy . . . Onyx Spring, Hollow Drill Steel and other special purpose steels.*

**CRUCIBLE WAREHOUSE SERVICE**

**Crucible Steel Company of America**

**For more facts circle 611 on Reply Card**

# Now add *Beauty*

## to low-cost, maintenance-free roofs and sidewalls with Color Galbestos

Robertson's fifty years of pioneering in the protected metal industry, teamed with its extensive program of research at famed Mellon Institute of Industrial Research has perfected a protected metal with built-in beauty. Now you can have Galbestos in colors!

All of the time-tested advantages of a long, maintenance-free service life, resistance to fire, corrosion and extreme weather conditions that have made Robertson the world's standard of steel protection for over fifty years are now available in four new attractive colors . . . red, green, buff and gray in addition to the familiar black and maroon.

Roofs and sidewalls of Color Galbestos bring the much desired element of color to industrial and commercial buildings at a lower cost than any other means. These new colors, used singly or in combinations, open a whole new field of functional beauty to building owners and designers.

ROBERTSON Color Galbestos

**H. H. Robertson Company**

2419 Farmers Bank Building • Pittsburgh 22, Pennsylvania

In England—Robertson Thain Ltd., Ellesmere Port, Cheshire
In Canada—Robertson-Irwin Ltd., Hamilton, Ontario

Please send additional information on **Color Galbestos.**

NAME TITLE

COMPANY

ADDRESS CITY

**For more facts circle 612 on Reply Card**


# NEW PRODUCTS

(Begins on page 170)

peratures, says manufacturer, and they require little maintenance and can be stored indefinitely in any state of charge without deterioration or fear of freezing. Corrosive fumes are not given off, and pressure release plugs prevent electrolyte spillage, it is noted.

Differing from company's pocket plate storage batteries, which contain active materials in perforated steel pockets, these new batteries contain plates composed of porous sintered nickel impregnated with nickel and cadmium oxides. The electrolyte is a solution of potassium hydroxide. Cell containers are plastic and grouped in steel cases. Nickel Cadmium Battery Corp.

### 43—OFFSET VALVE for instrument piping, general use

The Model 66U-VG is an offset valve with a vertical rising ball check on the downstream side of the seat and with a solid shank connection which, company notes, makes it acceptable as a block or root valve and makes it possible to eliminate the usual block valve. It is pointed out that these valves combine unions, nipples, reducers, elbows, tees, valves and drain valve into one space saving unit, thus reducing the number of threaded connections. They have a double seating stem for repacking under pressure and a pressure bleeder valve and test gage connection. Seats are regrindable and renewable. Jerguson Gage & Valve Co.

**Use the Reader Service Cards provided on pages 219-220 to ask for more information on these products. Circle item numbers of products in which you are interested.**

### 44—FUME DUCTS, HOODS of corrosion resistant plastic

Fabricated of a thermo-setting plastic material which is combined with glass or other synthetic fibers, Duracor Ducts and Hoods can be produced to virtually any required shape, it is announced. The combination of chemical resistance, lightweight, strength, workability, and attractive appearance is reported to make Duracor an ideal material for plating, pickling and chemical fume ducts. In addition, hoods and ducts fabricated by manufacturers from this material are claimed to provide a high degree of resistance to acids, including hydrofluoric, as well as alkalis and solvents. Physical properties of Duracor materials range from 11,000 to 15,000 psi for tensile strength; flexural strength ranges from 22,000 to 30,000 per sq inch depending on desired thickness. It is pointed out that because of lightweight and easy handling

# Keep production on the up and up

## with powerful, lightweight Keller Tool air hoists

Here's the hoist you can start and stop all day long—without any danger of a burned-out motor to halt production. It's powered by a Keller Tool axial piston air motor that just won't burn out.

Keller Tool air hoists offer other advantages as well, including easily controlled speed—fast for the high lift—creep for accurate load spotting.

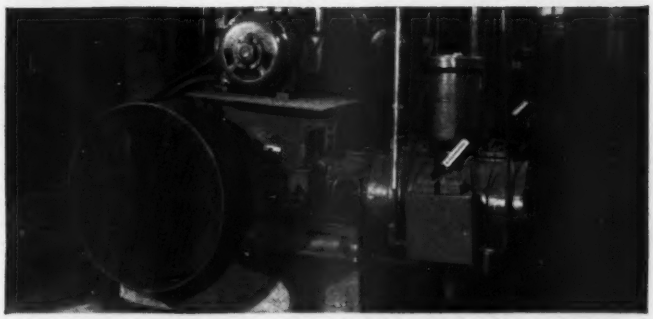
When you need a lift in a dusty room or in a corrosive atmosphere, a Keller hoist will handle the job without unusual maintenance. The enclosed air motor is made for such locations.

Every Keller Tool air hoist is light in weight in relation to its lifting capacity. Simplifies moving and hanging. All sizes furnished with roller chain; some sizes also available with link chain. Check the capacity you need in the table below:

| Model | Capacity | Speed | Weight |
|---|---|---|---|
| 86-1V3 | 300 lb. | 80 f.p.m. | 28 lb. |
| 86-1V5A | 500 lb. | 35 f.p.m. | 28 lb. |
| 86-1V10* | 1000 lb. | 19 f.p.m. | 28 lb. |
| 86-2V10 | 1000 lb. | 35 f.p.m. | 78 lb. |
| 86-2V20* | 2000 lb. | 19 f.p.m. | 78 lb. |

*Available with link or roller chain

**Send today for Bulletin 86.**



A popular unit in the compressor room: the Gardner-Denver RX. Capacities from 90 to 1300 cfm. Described in Bulletin HAC-40.

# GARDNER-DENVER

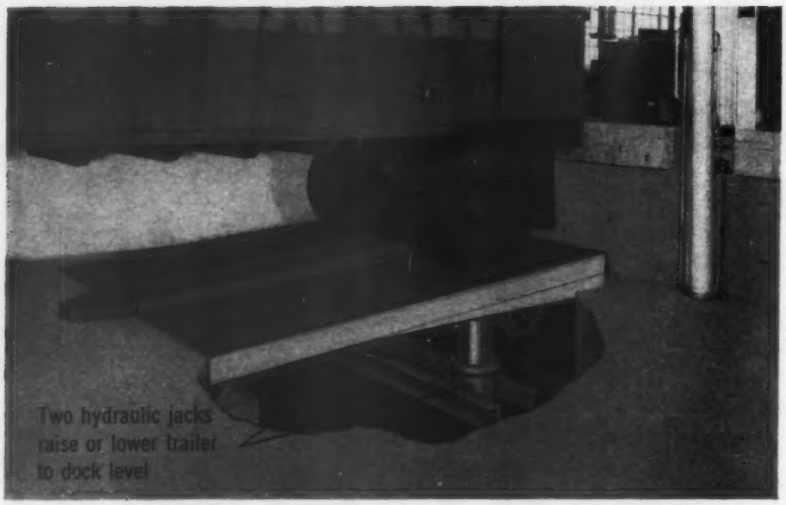
**KELLER TOOL division, Grand Haven, Michigan**

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

**For more facts circle 613 on Reply Card**

# NEW ROTARY TRUCK LEVELER

## saves loading costs and dock space




**HANDLES ANY HIGHWAY CARRIER AT ANY LOADING DOCK**

- Quickly levels any truck bed at dock height so pallet trucks and other materials handling equipment can move in and out with maximum speed and safety.
- Takes no space . . . installed in driveway in front of dock, leaving dock platform completely free of obstructions.
- 40,000-lb capacity, 24" travel . . . handles any highway carrier at any loading dock.
- Raised center curb section guides wheels onto runways for fast, accurate truck positioning.
- Dependable, economical hydraulic operation by Rotary Oildraulic electric power unit.

**For new or old buildings**

The Rotary Truck Leveler is easily, inexpensively installed in any building. It is the ideal equipment for docks where construction or space limitations prevent use of ramps. Changes in materials handling systems or equipment will never make the Rotary Truck Leveler obsolete. Mail coupon below.

Rotary
Truck Leveler
Manufactured by
ROTARY LIFT CO., MEMPHIS 2, TENN.
Specialists in oil-hydraulic lifting devices.

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Rotary Lift Co.
1058 Kentucky
Memphis 2, Tenn.

Send complete data on the Rotary Truck Leveler to:

Name _____

Address _____

_____

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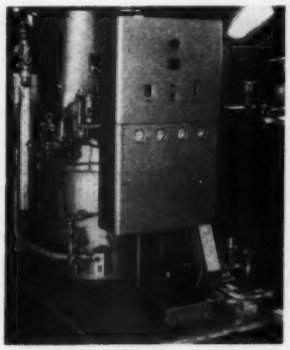
# NEW PRODUCTS

(Begins on page 170)

these ducts and hoods require only minimum installation time and overhead ducting can be supported simply because of the low weight. The Ceilcote Co., Inc.

## 45—GENERATOR is fast steaming, compact unit

Model 4615 Vapor Modulatic is announced as a steam generator with only 99 sq ft of heating surface, which produces 400 to 1750 lb of steam per hour, from 60 F feedwater at 75 to 300 lb steam pressure. It is designed to develop 200 lb steam pressure in 2 min from cold water. Automatic controls cause generator to cycle on and off and change volume of steam produced to meet a changing demand, it is noted; and a servo-water-bypass control meters fuel, feedwater and combustion air, so that the



unit produces steam at about 80 per cent efficiency at all outputs. Working pressure is changed by turning one control.

Only 84 in. long, 48 in. wide, and 70 in. high, this unit owes its compactness to two design features: the pressure atomized fire releases more heat per cubic foot of combustion space; and the 337-ft long steel coil is designed so that hot gases from the fire wipe over and around the coils, transferring heat to the water being pumped through the coils under pressure and turning this water into steam.

Burners are available for No. 2 fuel oil, for natural gas, and for combination oil or gas. Fuel is changed by flipping a switch. Several protective safety controls are built in. The Model 4615 Vapor Modulatic is a complete package with 3-hp electric motor, blower, feedwater pump, steam separator, fuel pump, and controls all mounted on steel base. No special walled-in area is necessary, says manufacturer, and the units are ready to operate when service connections are made. Vapor Heating Corp.

## 46—BRAKEMOTORS designed to hold heavy loads

These rugged, cast-iron brakemotors stop instantly and hold heavy loads, manufacturer claims, and they afford long,

J

FORD ASSEMBLY PLANT
San Jose, California

# Plant saves on 45 acres of overhead work with

## UP-RIGHT
*aluminum*
SCAFFOLD-ON-WHEELS

17 FT. SCAFFOLD ASSEMBLED
IN 2 MINUTES BY 2 MEN

Faster, better, safer
work from
large enclosed area

WRITE FOR
CIRCULAR

You, too, can save with these rapidly assembled Up-Right aluminum scaffolds
Up-Right Scaffolds • Dept. 163 • 1013 Pardee St., Berkeley, Calif.

**For more facts circle 615 on Reply Card**

**For Removal of Dust, Fumes, Gases, etc.,**

**flexible**

# Spiratube

**does the job better . . .**
**cuts maintenance costs!**

Lightweight Spiratube® is the answer to many an application where fume removal, ventilation and dust problems are concerned. Because of its patented preformed helical wire support design, Spiratube "springs to work" and stays extended even on tight turns . . . costs less to install and maintain—downtime is reduced to a minimum—and Spiratube can snake around and over obstructions, eliminating the use of costly elbows and fittings.

Spiratube is ideal for portable and semi-permanent applications. Sections can be linked together or detached in a matter of seconds without the use of tools. If machine changes are made, Spiratube can be assembled and disassembled and reused over and over again.

Spiratube is available in sizes from 3" to 30" in a variety of covers. Investigate this low-cost method of air or dust handling today. Stocks are available from leading distributors across the country. For further application information about this product, please send coupon below.

***See us at the Plant Maintenance and Engineering Show***
***Cleveland Public Auditorium, January 28-31, 1957, Booth 1026***

**Flexible Tubing**
CORPORATION
**GUILFORD, CONNECTICUT • LOS ANGELES 64, CALIFORNIA**

Flexible Tubing Corporation, Dept. 91, Guilford, Connecticut
Please send me illustrated catalog and more information on Spiratube.

Name_____

Title and Company_____

Address_____

City_____ Zone_____ State_____

**For more facts circle 616 on Reply Card**

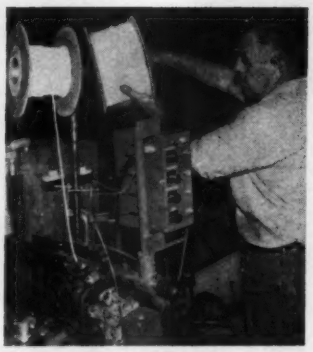

# NEW PRODUCTS

(Begins on page 170)

trouble-free service on a wide range of equipment from bottle-washing machinery to heavy-duty cranes. Features announced include a wide torque range from 3 lb-ft to 345 lb-ft, one-piece molded friction linings and one-operation torque setting. In the event of power failure or low voltage, "dead man" operation sets and holds the load until normal operation is restored. A variety of enclosures are available, including those suitable for outdoors or where extremely moist, corrosive, or abrasive dust conditions exist. Reliance Electric & Engineering Co.

## 47—HOT MELT ADHESIVE comes in coil form

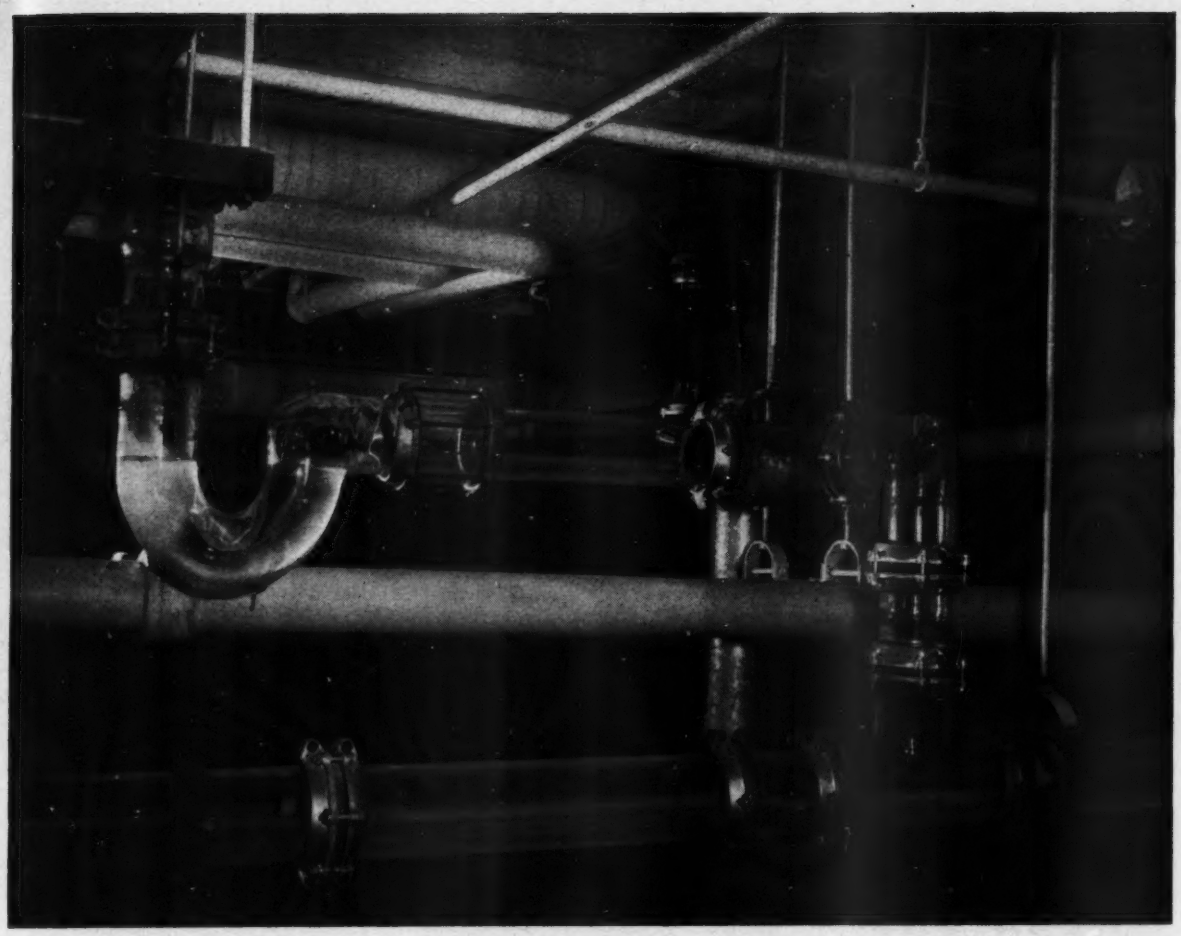
Thermogrip, a thermoplastic adhesive in coil form, is designed for application with a special feeding and melting device that can be attached to various types of



packaging machinery. Polyethylene films, foils, glassine and other boards and papers can be bonded at high speeds, it is noted. A principal advantage reported for this adhesive is ease of use. Conventional glue pots are not required and clean up, pre-melting and waste are avoided. Electric heat controls are switched on a few minutes before operating and switched off at the day's end. Instant bonds and better control of the adhesive's temperature and application are also reported. United Shoe Machinery Corp.

## 48—PROTECTIVE COATING for metal, masonry, wood

Profilm, a silicate modified coating, looks like paint, is applied by conventional spray equipment, and is reported to dry to the touch on most applications in a few minutes. It is intended for use where corrosive elements such as acids, alkalis, humidity, moisture, salt, etc., are a source of coating failure. Profilm comes in colors, as well as in black, clear, white, and metallics, in both baking and air-dry grades. According to announcement, it can be applied to virtually any coatable surface including ferrous and non-ferrous metal, masonry, wood, and asbestos. Because of its essentially inert composition, Profilm is said to provide a uniform,



# How to get rid of acid wastes . . . safely

Your engineers have licked the problem of disposal of your acid wastes. One problem, though, probably does remain . . . how to get them to the point of disposal . . . safely.

**THE ANSWER?**
*Glass*...PYREX brand *"Double-Tough" glass pipe.*

Unlike other materials, once in, PYREX pipe is there to stay. No acids, except hydrofluoric and raw phosphoric, will attack this glass. And even though the effects of these two acids are measurable after some time, PYREX brand glass No. 7740 will still give you a whale of a lot of worry-free time.

**BUT WHAT ABOUT FRAGILITY?**
This particular glass formula is *made* for industrial use. It will stand years and years of service. And acid materials won't weaken it. You've seen metal pipe carrying acids that was corroded to paper thinness. You'll never see that with PYREX pipe.

And speaking of seeing. PYREX pipe is transparent. You can always see exactly what's going on inside of it. It's easy to clean, too . . . visibly clean.

Your own maintenance men or pipe fitters can install it as easily as ordinary pipe . . . and it comes in sizes from 1" to 6" in diameter with a wide range of fittings.

Write for Bulletin EA-3, "PYREX 'Double-Tough' Glass Pipe and Fittings." It details the complete line.

**For more facts circle 617 on Reply Card**

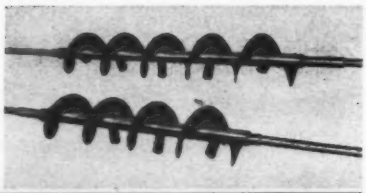
Section of PYREX acid drainline installation in photoengraving plant.

*Corning means research in Glass*

**CORNING GLASS WORKS**
**10-1 Crystal Street, Corning, New York**

Please send me a copy of your PYREX pipe and fittings catalog.

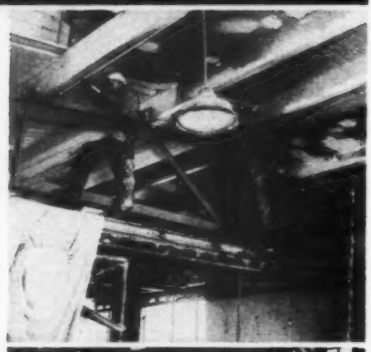
Name .....
Title .....
Company .....
Street .....
City ..... Zone .... State .....



somewhere

in your plant

you need



Atlas Neoprene Coatings

If yours is a typical plant involved in everyday processing operations, chances are that plant structures and equipment are subjected to continuous corrosive attack.

Whether your problem is the maintenance of ceilings, walls, trenches and structural members, or the protection of processing vessels, fume exhaust systems and storage tanks from a specific corrosive or abusive attack, there is an Atlas Neoprene Coating to do the job.

The Atlas Neoprenes are the result of over 16 years of pioneering in the protective coating field. Through extensive research and expert compounding techniques, Atlas has developed a complete line of tough, flexible, corrosion and abrasion resistant neoprene materials for every coating requirement.

To assist you in the selection of the proper Neoprene Compound to solve your problem, write for Bulletin 7-N.

ATLAS MINERAL PRODUCTS COMPANY
MERTZTOWN, PENNSYLVANIA

For more facts circle 618 on Reply Card


# NEW PRODUCTS

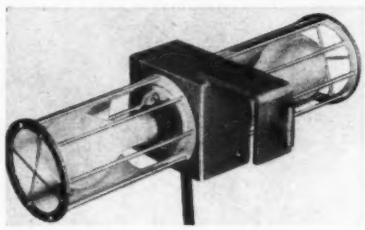
(Begins on page 170)

continuous and low porosity film which lends resistance to a variety of chemical environments.

Present and potential applications include both production finishing and industrial maintenance uses. It is reported that the rapid drying characteristics of Profilm often permit application of successive films without moving scaffolding; baking grades cure on short cycles. Overspray will reportedly dry before it can damage adjacent surfaces. Other characteristics announced for Profilm are that it will not support combustion, is not toxic, that cement will not adhere to it, and that scum will not form on exposure to air. Allied Porcenell, Inc.

## 49—PORTABLE LIGHT shines inside the freight cars

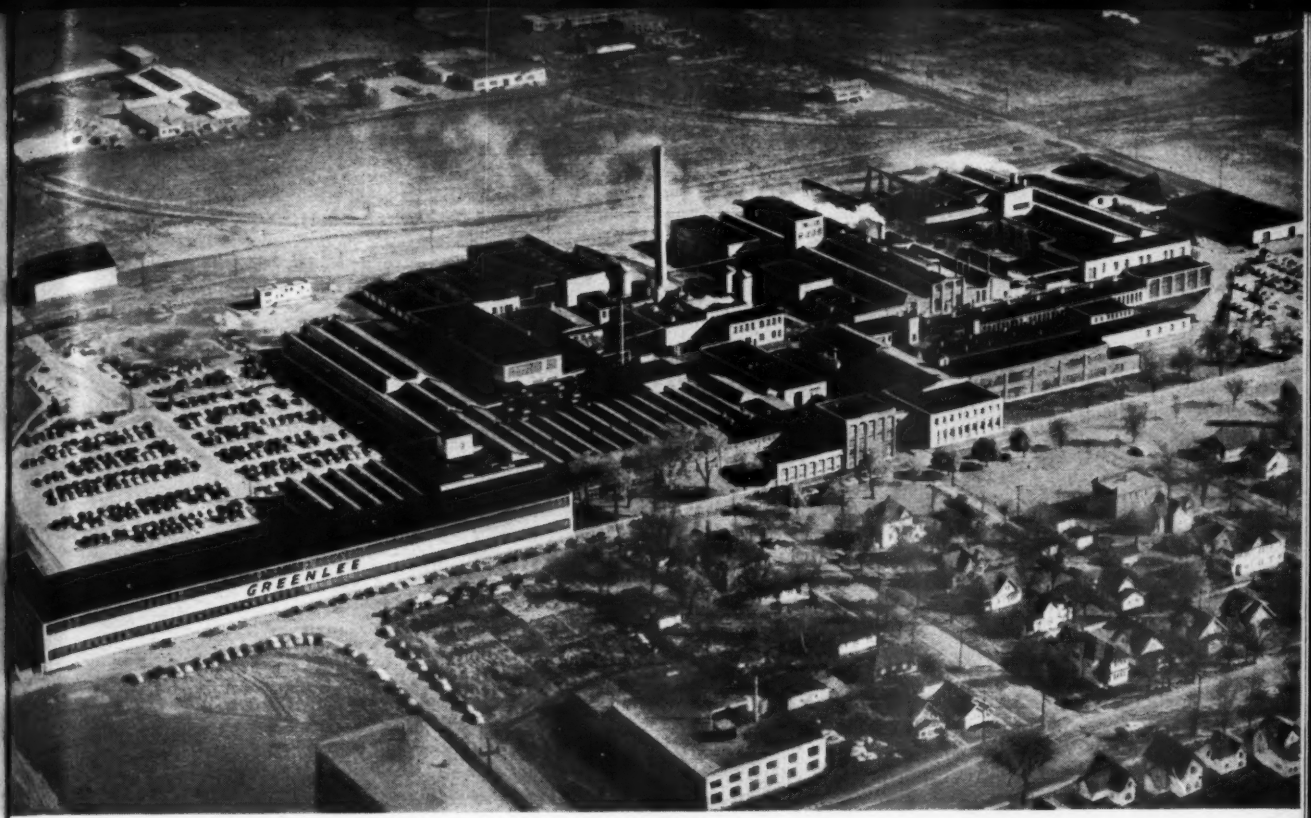
The Cargo Light will accommodate two bulbs up to 200 w in size. The bulbs are supported in rubber-mounted sockets to resist shock and are protected by plated steel reflector guards, which may be rotated to direct the light. The mounting bracket is specifically designed for hanging the unit in automotive-type freight cars but special purpose brackets may



be obtained. Thirty-five feet of three-conductor, chrome yellow, power supply cord is supplied with a three-prong, grounding-type electrical plug. The cord is visible in the dark to prevent accidents. Lamp guards and the 14-gage steel body are grounded. The unit is 17½ in. long, weighs 9 lb, including cord. Hoffman Engineering Corp.

## 50—HIGH-VOLTAGE STARTER incorporates contactor

In these NEMA Class E-1 high-voltage air-break starters a contactor has replaced current-limiting fuses to provide interrupting capacity. According to company, when the need for increased interrupting capacity arises, the starter may be easily and inexpensively converted to provide a maximum interrupting capacity of 150 mva at 2300 v and 250 mva at 4000 or 4600 v. The line can be applied in any plant where a high-voltage starter is needed and the available power supply is limited to 50 mva or less. For use on utilization voltages of 2300 to 4600 v, starter incorporates the best features of company's Limitamp controllers. It is entirely front-connected, requires a minimum amount of floor space (30 in. deep




# GREENLEE BROS. & CO. CUT FUEL COSTS 17%

## B&W boilers with Jet Ignition Stokers assure savings despite increased fuel prices

As one of the country's leading machine tool manufacturers, Greenlee Bros. & Co., Rockford, Illinois uses large amounts of steam for all year operation of air compressors and for plant heating. And to maintain profitable overall operation it is important that the steam supply be dependable—and steam generating costs kept to the minimum.

Since the installation of two B&W Integral-Furnace Boilers, Greenlee has enjoyed uninterrupted steam service from a dependable, efficient source. Equipped with modern B&W Jet Ignition Stokers, these units have built a record of operating efficiency while burning a wide variety of Illinois bituminous coal.

At Greenlee, as at other industrial plants using steam, careful consideration of long term costs and proven reliability were important factors in the choice of B&W Integral-Furnace Boiler units.

If your steam production cost is important . . . if you are considering steam plant modernization or expansion for increased dependability and efficiency . . . it will pay you to investigate B&W's more than 90 years of boiler experience. Let us show you what it can do for you.

For further information or assistance write to The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

Two B&W Integral-Furnace Boilers at Greenlee, equipped with B&W Jet Ignition Stokers, burn a wide variety of Illinois bituminous coal.

### HERE'S WHY YOUR STEAM COSTS LESS With B&W Integral-Furnace Units

- Minimum floor space and headroom requirements
- High fuel economy
- Smokeless combustion
- Adaptable to all fuels and firing methods
- Economical fast steaming
- Water-cooled furnace
- Clean, dry steam at all ratings, even with high boiled water concentration
- Quick response to wide and heavy load swing demands
- Easy to inspect and clean
- High availability with least attention

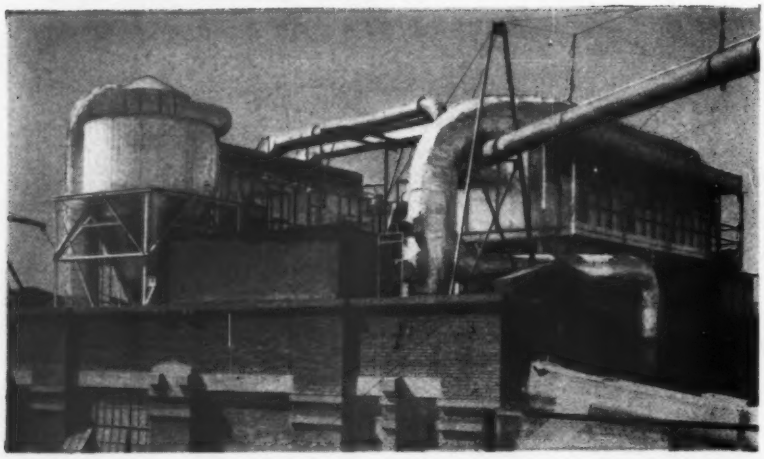
**BABCOCK & WILCOX**

BOILER DIVISION

G-827-1B

**For more facts circle 619 on Reply Card**

# GRAIN...



**KELLOGG COMPANY,** Battle Creek, Mich., saves $1,400 a *day* with Pangborn Dust Control! That's the value of the 35 tons of cereal "dust" salvaged every 24-hour day. In addition, Pangborn Cloth Screen Collectors keep Kellogg's buildings spotless, reduce machinery maintenance and have made working conditions safe and comfortable for employees.

# or GRANITE...

**H. E. FLETCHER CO.,** West Chelmsford, Mass., produces a wide variety of granite products. When Fletcher recently expanded plant operations, the firm installed Pangborn Cloth Screen Dust Collectors on the recommendation of an already-satisfied user of Pangborn Dust Control. Today costs at Fletcher have been cut in three ways; salvaged dust is sold to another firm, machine life is lengthened by reducing dust damage, plant housekeeping is cheaper.

# Pangborn CONTROLS DUST

Pangborn can solve *your* dust problem. Pangborn engineers will be glad to show you how Pangborn Dry or Wet Dust Collectors can save you time, trouble and money! See how Pangborn benefits varied industries. Write for free copy of "Out of the Realm of Dust." PANGBORN CORP., 3200 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Dust Control and Blast Cleaning Equipment.*

**For more facts circle 620 on Reply Card**


# NEW PRODUCTS

(Begins on page 170)

by 38 in. wide by 90 in. high), has a roll-out contactor, gang-operated disconnect switch, and a maximum rating of about 3000 hp at 4600 v. General Electric Co.

## 51—INDUSTRIAL MATTING is colorful, long lasting

Industrial matting can be colorful and long-lasting, too, manfacturer announces in introducing this multi-link matting made of vividly-colored Koroseal links claimed not to stain, discolor or fade with time. The long-lasting links are also said to resist aging, abrasion, acids, caustics and oil. They are closely spaced to prevent women's heels from catching in them. The multi-link matting is blue, yellow, black, green, white, red and orange. The links are strung on parallel spring steel rods and the mats are finished on all sides with Koroseal nosing, either square or tapered. B. F. Goodrich Industrial Products Co.

## 52—PLUG VALVE is easily operated by handle

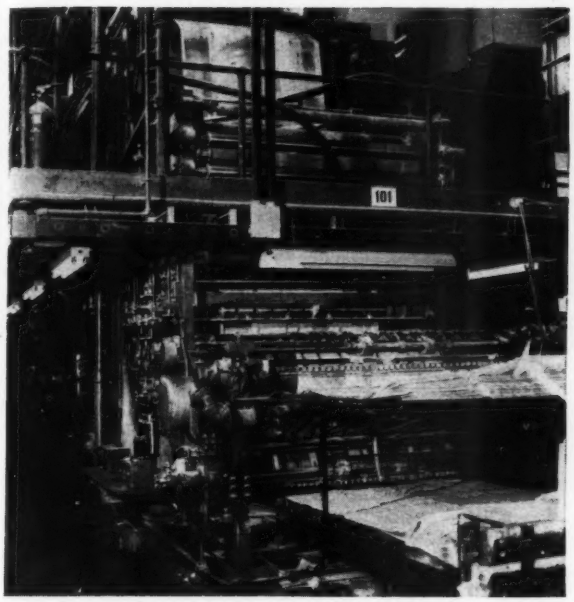
This plug valve provides leakproof shut-off, it is announced, and is operated by a handle that opens and closes against pressure without effort. Its design features use of three O-rings. In closed position, one of these contained on the surface of the plug (90 deg from flow passage through plug) serves as a flow seal. This flow seal O-ring surrounds the inlet port and provides tight shut-off. In open position, the valve is full ported and allows a straight-through passage. Static O-rings at top and bottom of plug and around its circumference serve to prevent stem leakage. The valve is made of brass, is available in ¼-in. female pipe connections. Circle Seal Products Co., Inc.

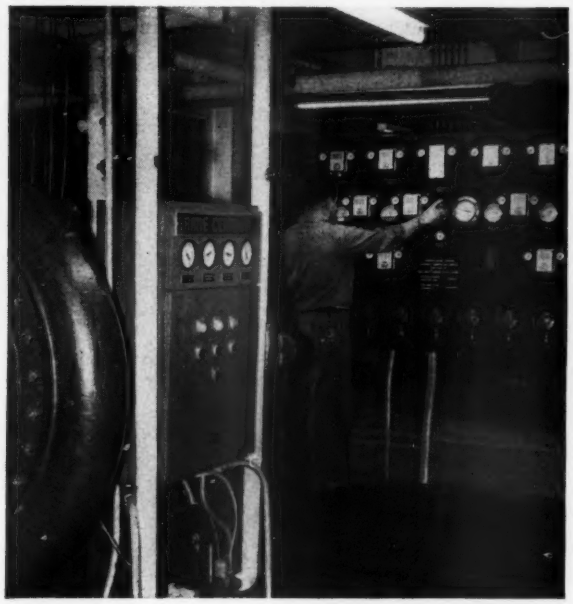
**It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 219-220. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.**

## 53—PLASTIC LINER offers corrosion-resistance

For use wherever non-corrosive liners are required, Coroline 347 is announced as an epoxy base compound which is inert to organic acids, dilute mineral acids, to caustics, alkalines and most solvents. It is suggested for lining tanks, scrubbers, steamers, columns and ducts, and reported particularly successful for use with petroleum products. Coroline 347 is composed of two parts which are

# Controlled Water Supply Cuts Downtime... Helps Meet Production Deadlines





**PROBLEM:** *The Condé Nast Press* formerly used a large volume of city water in the cooling rollers of its giant press batteries. High speed, quality printing of leading magazines such as* House & Garden *and* Glamour *requires a constant source of chilled water to quick-set ink after it is heat-dried. Trouble developed in the summer months—water pressures were too low and the temperatures too high. There was even the threat of a complete water cut-off during shortage periods.*

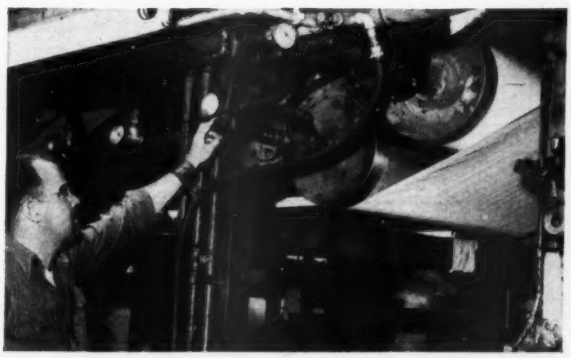
**SOLUTION:** *The answer proved to be recirculation of the water in a closed system, the use of mechanical cooling equipment and the installation of a flexible, high-efficiency control system to insure uniform water temperature and pressure. The cooling load is handled by two 150 hp compressors and a large heat exchanger. Process water flows through the cooling rollers on the presses and is either returned to the refrigeration units or to the heat exchanger for recooling.*

Precision, waste-free operation of this interesting system is provided by a specially-engineered Johnson Automatic Temperature Control System. The compressors are operated, in sequence as needed, to maintain a constant chilled water temperature. Sensitive, fast response to sudden load changes is a must. As presses start and stop, load shifts often range from zero to 100 per cent and vice versa within minutes.

Whenever the outdoor temperature is sufficiently low, compressors are automatically stopped, and the process water is chilled by passing condenser water from the cooling tower through the heat exchanger. Condenser water temperatures are regulated by a Johnson Thermostat controlling the cooling tower fans. This automatic changeover arrangement minimizes operating costs and helps extend the life of the compressors.

Constant water pressure is maintained by a Johnson Pressure Regulator which modulates a by-pass valve.

If you have a problem of heating, cooling, humidity or process control, Johnson can provide you with an equally successful, economical solution. The recommendations of a nearby Johnson engineer are yours without obligation. Johnson Service Company, Milwaukee 1, Wisconsin. Direct Branch Offices in Principal Cities.



**RESULTS:** *Variations in the supply, temperature and pressure of water have been eliminated. Downtime is reduced as accurate temperature control prevents excessive ink build-up on the cooling rollers. Application of a heavier ink film can be used to improve magazine quality. Close production schedules are met consistently—without regard to outside water sources.*

**JOHNSON CONTROL**

SINCE 1885

**PLANNING • MANUFACTURING • INSTALLING**

*The Condé Nast Press, Greenwich, Conn. J. Gerald Phelan, architect, Bridgeport; Fletcher-Thompson, mechanical engineers, Bridgeport; John Winkel Co., Inc., mechanical contractor, Larchmont, N. Y.

**For more facts circle 621 on Reply Card**

WITH Pantex SPEEDYLECTRIC STEAM-JET CLEANING

Of course, it takes a lot more than cleaning to make a used machine tool "good as new" . . . but there's hardly a tougher cleaning job in the industry. Compared to previous cleaning methods, this major machine tool plant* found that the Speedylectric Steam Jet cut cleaning costs in half — and did a better job.

For on-line cleaning of heavy machine tools, Speedylectric Steam-Jet Cleaners solve a host of problems. The jet of "dry" steam and detergent wipes away accumulations of grease and dirt far faster than hand methods, scouring inaccessible crannies as quickly as it cleans open surfaces. There's no flooding of the work area, and NO fire hazard — the high pressure steam is generated electrically, with no flame, and no fumes.

A Speedylectric utilizes the electrode principle, simplest and lowest-cost method of generating steam electrically. It's portable . . . requires practically no maintenance . . . available for 220, 440 or 550 volts AC. MAIL COUPON for bulletin.

*Name on request

Need High Pressure Steam for Processing?

A Pantex Speedylectric Steam Generator placed adjacent to process assures constant temperature "dry" steam "at the flick of a switch". Low in first cost and 98½% efficient. Requires only about one-half the floor space of conventional boilers with equal capacity. From 2 to 60 Bhp, 15 to 500 Psi.

PANTEX MANUFACTURING CORPORATION
Box 660-AH, Pawtucket 1, R. I.
Send me facts and figures on:
☐ Pantex Speedylectric Steam-Jet Cleaners
☐ Pantex Speedylectric Steam Generators
Name and Title.....
Company.....
Address.....

For more facts circle 622 on Reply Card


# NEW PRODUCTS

(Begins on page 170)

mixed at time of application. It can be brushed or sprayed on and may be used in applying glass cloth or other fabrics. When more than one coat is required, successive applications may be made immediately. According to company, it has excellent adhesion qualities, can be applied on complex surfaces and hard-to-reach places as well as flat surfaces. The plastic hardens at ambient temperatures in approximately 24 hr, does not require high temperature cures. Applications can be checked by high voltage spark testing. The Homalite Corp.

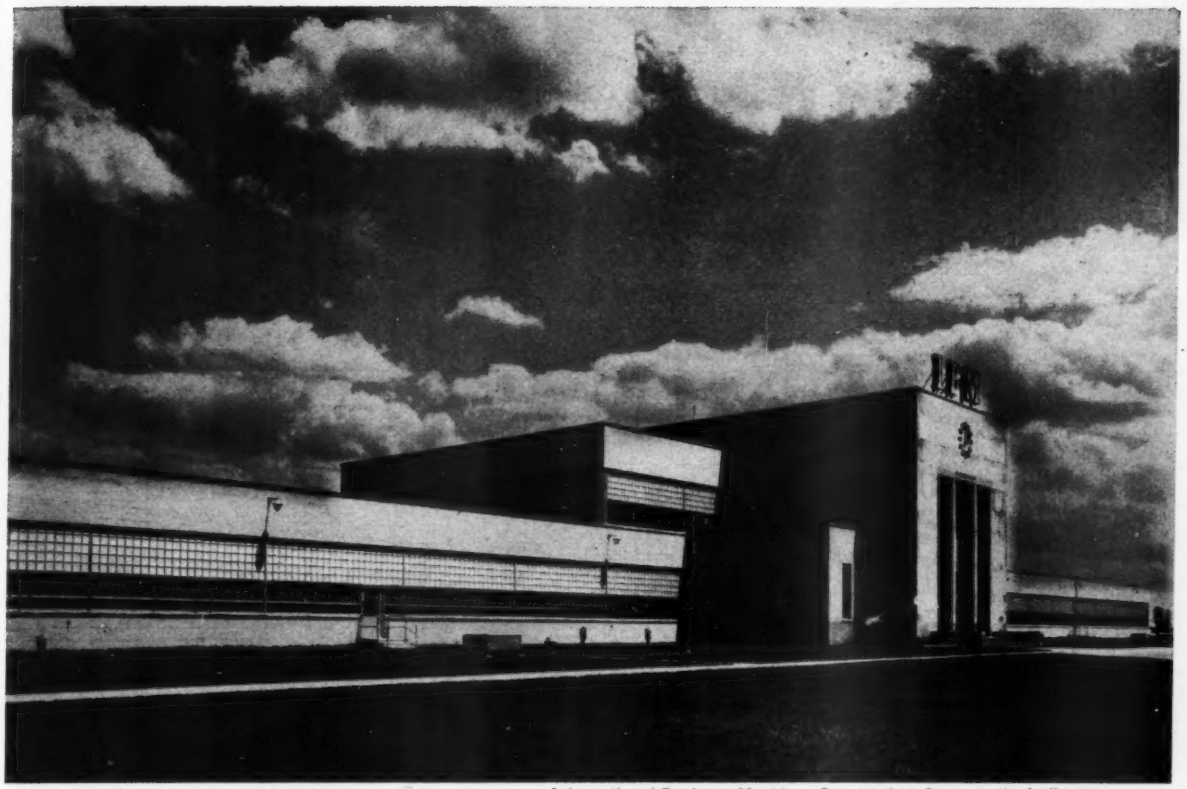
## 54—PORTABLE ELEVATOR lifts loads easier

This hydraulic foot lift portable elevator has been developed for loads up to 750 lb. The load is lifted by means of a foot pedal, as shown in the illustration. With the platform raised to the height desired, the operator is pulling a die onto the

elevator platform. The hydraulic unit of this elevator has an over-sized oil reservoir built into the base superstructure. Oil wipers are provided at the top of the ram, with an overflow tube back to the reservoir. The elevator has an all-welded steel frame, an overall height of 83 in. (for going through 7-ft doors), a lifting height of 71 in. and a 24-by-24 in. platform. Manufacturer notes that despite its sturdy construction, the unit weighs only 270 lb, due to its improved lift mechanism. It rolls on anti-friction bearings. Barrett-Cravens Co.

## 55—OIL REGULATORS offer precise pressure control

More accurate air pressure regulation is reported for the Series 20AG and 20AG-X Regulators, and this is said to extend over their full operating range, regardless of wide fluctuations in main line air pressure and varying air flow. Greater air capacity is also announced, as well as lowered prices on some of the smaller sizes, as compared with company's previous line, and on all models in the ½-, ¾- and 1-in. sizes. Other design features incorporated include larger air passages, balanced valve construction, im-



International Business Machines Corporation, Greencastle, Indiana
Engineers and Architects: Giffels & Vallet, Inc., L. Rossetti, Detroit, Michigan

# IBM benefits 4 ways with PC Glass Block Panels

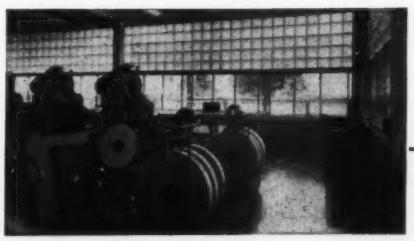
- *Controlled daylighting*
- *Reduced heating and cooling costs*
- *Elimination of sash maintenance costs*
- *Minimum washing contract costs*

IBM and its architects were well aware that the intricate production jobs handled at this plant would require plenty of daylight. But it had to be the right kind of daylight—controlled and glare-free. Insulation value of the window areas was another consideration—ordinary windows in a continuous band 8½ feet high *could* throw an excessive and costly load on the heating and air conditioning systems. And what about maintenance and washing? Costs for these items *could* jump way out of line unless steps were taken to remove the causes of these headaches.

This planning led to the use of PC *light-directing* Glass Block panels, footed by a double-glazed vision strip. The blocks, *mortared* into five-foot high panels, bring in controlled daylight that helps workers see better. Insulation value of the glass blocks (equal to that of an 8-inch masonry wall) reduces heating and cooling costs. And because there is nothing to rust or rot, the glass block panels are maintenance-free. A twice-a-year washing is all that's necessary.

For new construction or modernization, you'll find it profitable to investigate the advantages of PC Glass Blocks. For more information, see us in Sweet's, or write Pittsburgh Corning Corporation, Dept. PG-17, One Gateway Center, Pittsburgh 22, Pa. In Canada: 57 Bloor Street West, Toronto, Ontario.

PC Glass Blocks mean better looks outside—better light inside.



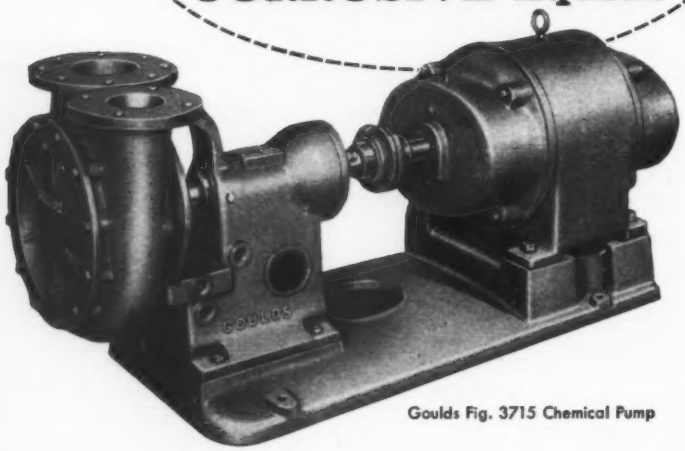
# PC Glass Blocks

PITTSBURGH PC CORNING ®

Also manufacturers of FOAMGLAS® insulation

For more facts circle 623 on Reply Card

## Here's a pump especially designed for your ABRASIVE and CORROSIVE liquids




Goulds Fig. 3715 Chemical Pump

You minimize your "hot" pumping problems — and expenses — with Goulds chemical pumps because *they're built to take it!*

With the Fig. 3715 pump, you can handle liquids that would "murder" most pumps. Such liquids as acid, alkaline liquor, hot size, and slurry. But this pump offers more than just severe service design. You get fewer maintenance problems plus special operating advantages.

**For example**

Look at the support head—its rugged, box-type design with water jacket permits you to pump liquids as hot as 350° F. Over - lubrication is prevented by grease - lubricated standard bearings with grease relief. You can adjust impeller clearance without any dismantling by means of a simple, positive external arrangement.

A variety of construction materials meets every need. Goulds Fig. 3715 pumps come in Type 316 and Gould-A-Loy 20 stainless steel, all aluminum-bronze, all iron or bronze-fitted.

**More reasons why**

There's a wide range of sizes, too—nine in all—with capacities up to 720 GPM and heads to 200 feet. You can keep a low spare parts inventory since many of the parts are standardized for interchangeability between sizes.

There are many more reasons why you can save money and avoid maintenance headaches by pumping those harsh liquids with a Goulds Fig. 3715 pump. Learn about them by addressing your inquiry to Goulds Pumps, Inc., Seneca Falls, New York.

**ASK FOR BULLETIN 725.4.**

Goulds PUMPS INC. Seneca Falls New York

MEMBER

**SALES OFFICES:** Atlanta • Boston • Chicago • Houston • New York • Philadelphia • Pittsburgh • Tulsa

**For more facts circle 624 on Reply Card**

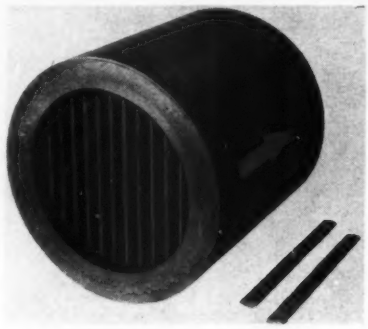

# NEW PRODUCTS

(Begins on page 170)

proved siphon tube action, and hand-removable bottom plug for easier maintenance. The regulators are also designed for use with water, oil and non-corrosive gases. They are available in pipe sizes from ¼ through 1 in., in relieving and non-relieving types. Full details are in Brochure 566. C. A. Norgren Co.

## 56—ENTRAINMENT SEPARATOR is corrosion-resistant

Developed for removal of liquid particles from air and other gases is this impingement type entrainment separator made of company's Karbate, impervious graphite. Called the Type MV Scrubber, it is a compact, self-contained unit ready for insertion in a pipeline. Rods of impervious graphite, streamlined in cross-section, are staggered in rows within the

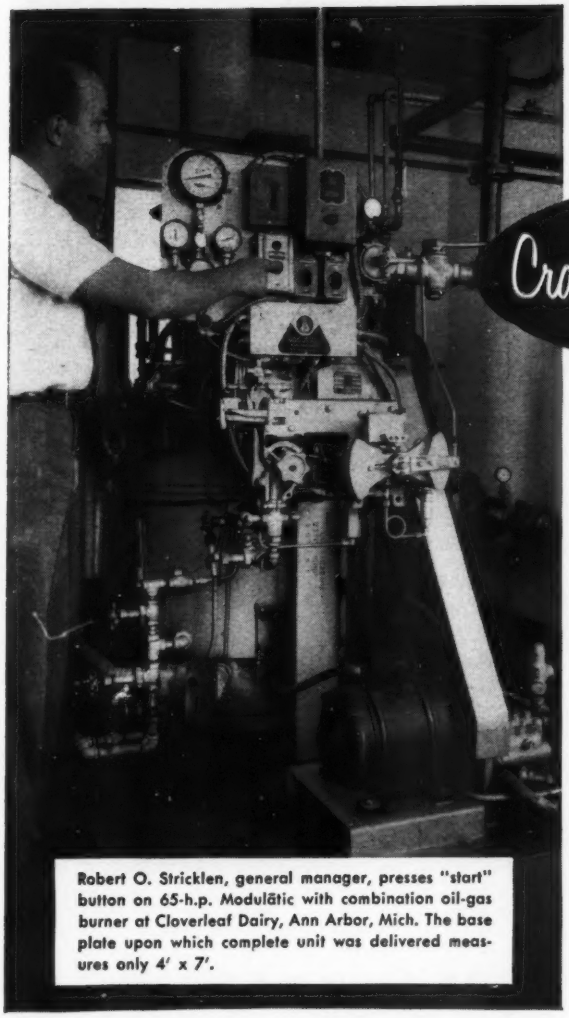


cylinder. It is noted that although minimum clearance is ¼ in. to prevent clogging, a beam of light will not pass through. As the gas to be scrubbed flows through the cylinder, moisture particles impinge on the separator rods.

At a pressure of one atmosphere, the scrubber is designed for gas approach velocity of about 30 ft per second, at which the pressure drop is less than 1 in. (water column). The pressure drop is lower under vacuum conditions. It is explained that at velocities twice those designed for, re-entrainment occurs, but it is retarded by the teardrop cross-section of the separator rods. Impervious graphite materials in the scrubber are chemically inert to mineral acids, organic solvents, salt solutions and other corrosives, company states. The unit can be operated at -40 to 340 F, at pressures from full vacuum to 65 psig. It is available in four internal cylinder diameters from 6 to 16 in. Each cylinder is 22 in. long, designed for installation between 150-lb ASA flanges. National Carbon Co., Union Carbide and Carbon Corp.

## 57—LEVEL GAGES for high or low mounting

Inclined Truscale Remote Reading Liquid Level Gages are introduced for mounting high or low on the instrument panel, or at other points. For high installations



Robert O. Stricklen, general manager, presses "start" button on 65-h.p. Modulātic with combination oil-gas burner at Cloverleaf Dairy, Ann Arbor, Mich. The base plate upon which complete unit was delivered measures only 4′ x 7′.

# Starved for steam?

# Cramped for space?

## . . . here's how **Cloverleaf Dairy** solved both of these problems **— saved time and money, too!**

Like all dairies, Cloverleaf uses a lot of steam for pasteurization, cleanup, sterilizing milk bottles, sanitizing handling equipment and cans. They needed more steam than their old boiler could supply—and they needed more room—but the only possibility for plant expansion was a vacant space which scarcely held an automobile.

What to do? *Install a Modulātic Steam Generator, of course!* Today, in less than half of this small building-extension, Cloverleaf produces their full steam requirements, and uses the rest of the addition for storage. What's more, you'll now find washing equipment and a new storage tank where the old boiler room and coal bin used to be.

"But just as important," says Mr. Stricklen, "is Modulātic ability to give us plenty of steam at the constant pressure we want . . . to give us 2-minute steam from cold starts. Now we have no overnight firing, no waiting, no interruptions in production—yet our steam costs are at least 10% lower, without downtime or maintenance except normal servicing."

# MODULĀTIC STEAM GENERATOR

## — *world's most compact power-package*

### MODULĀTIC FACTS IN BRIEF

| | |
|---|---|
| Eight Sizes | 10 to 160 h.p. |
| Pressures | 2 to 1000 p.s.i. |
| Fuel | Oil, Gas, or Combination Burner |
| Floor Area (160 h.p.) | 5′ x 8′ |
| Height (160 h.p.) | 6′-10″ |
| Floor Load (max.) | 150 lbs./sq. ft. |
| Operation | Automatic |
| Number in Use | Over 13,000 |

No separate enclosure, expensive stack, or special foundation needed. Multiple-unit installations can have a single, coordinated control.

If you use steam for heating, power, or processing, the self-contained, pushbutton Modulātic is a development you should surely investigate. It's clean, quiet, follows fluctuating load up or down with unmatched speed and accuracy—just set controls for the pressure you want, Modulātic does the rest! Why not mail the coupon *right now?*

**VAPOR HEATING CORPORATION**

80 E. Jackson Blvd., Chicago 4, Illinois, Dept. 18-A

Please send me free 12-page Modulatic Booklet No. 586.

Name_____ Title_____

Company_____

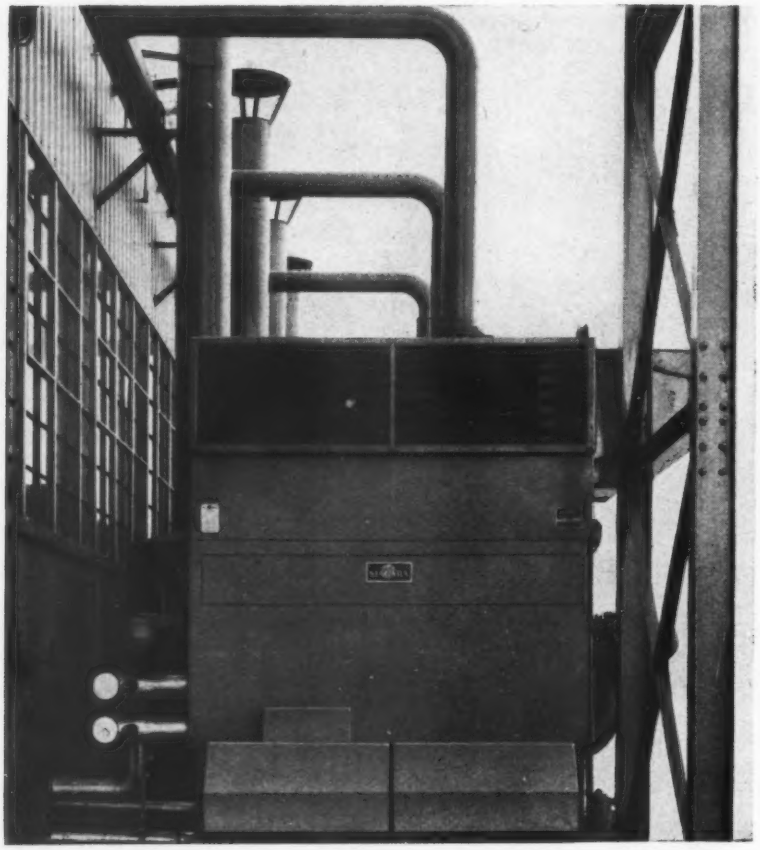
Street_____

City, Zone, State_____

**For more facts circle 625 on Reply Card**

# HOW YOU SAVE . . .

## *Getting Drier Compressed Air*



**Save the cost of Cooling Water and you save the price of the NIAGARA AERO AFTER COOLER (for compressed air or gas) in less than two years.**

● Extra, for no cost, you get drier compressed gas or air for your process. You get better operation and lower costs in the use of all air-operated instruments, machines, or paint sprays. You save expense for piping, pumping, water treatment and disposal. You get the use of badly needed water elsewhere in your plant.

Niagara Aero After Cooler cools compressed air or gas (evaporatively) below the temperature of surrounding atmosphere, with no further condensation in your air lines.

Write for complete information; ask for Bulletin 130, or contact nearest Niagara Engineer if you have any problem involving the industrial use of air.

**NIAGARA BLOWER COMPANY**

Dept. PE, 405 Lexington Ave. New York 17, N. Y.

*Niagara District Engineers in Principal Cities of U. S. and Canada*

**For more facts circle 626 on Reply Card**

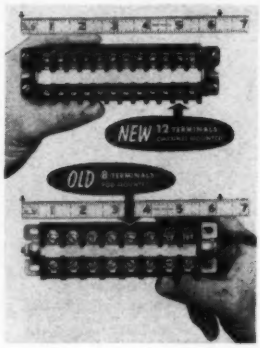

# NEW PRODUCTS

(Begins on page 170)

the case is built so the cover and scale incline downward; for low installations the case is built so cover and scale incline upward. It is noted that all Truscale Gages are designed to give instant remote reading of liquid levels with accuracy of ½ to 1 per cent of scale reading; they have a convex face with scale marking directly on the face to give 180 deg visibility. They may be equipped with signal horns, lights, other warning devices. Bulletin 291 gives data. Jerguson Gage & Valve Co.

### 58—TERMINAL BLOCK holds more terminal space

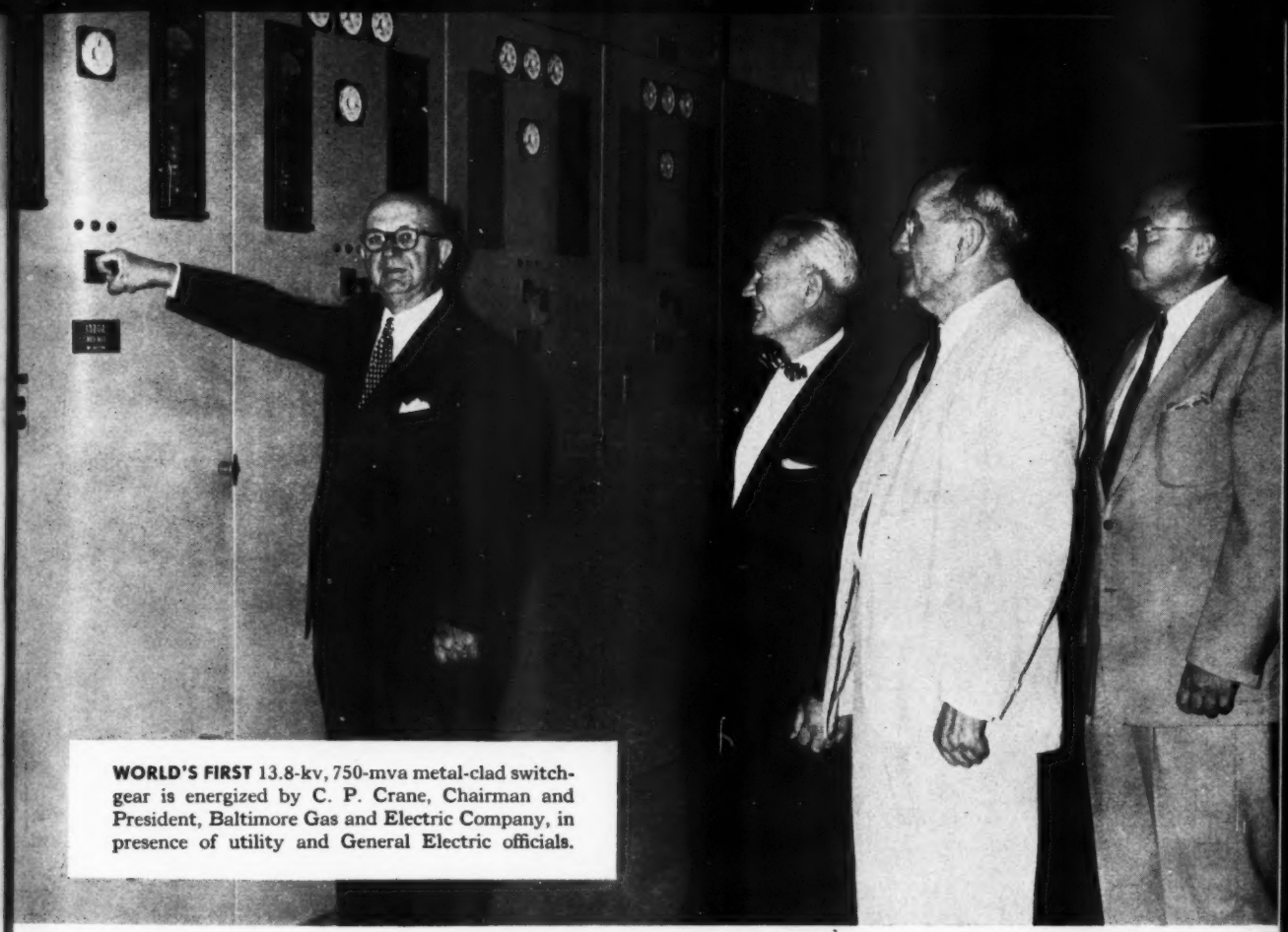
This channel-mounted terminal block has 50 per cent more terminals in the same space, it is announced, and features simplified assembly and modification. Blocks




are 25-amp box lug type terminals. Also available are 25-amp terminals with pressure wire connectors and 50-amp box lug terminals. All three types may be grouped in any manner on the same channel. An important feature announced for these blocks is their channel mounting which permits blocks to be constructed in any desired number. Channel mounting makes it possible to add terminals to existing blocks, either at ends or in the middle, using only a screwdriver and with little disturbance of existing terminals. Blocks are said to be suited for most 25-amp and 50-amp uses. The Square D Co.

### 59—MAGNETIC STARTER has constantly moving arc

With the addition of this Size 4 a-c magnetic starter, company's line of Type CY Starters has been extended from Size 0 to 4, making these vertical-lift starters available for over 95 per cent of industry's a-c requirements, it is announced. According to company, all maintenance and inspection, including removal and replacement of components, can be accomplished from the front, without special tools, and without removing starter from its panel or enclosure. Type CY Starters, Size 2 and larger, utilize combination of twin-break contacts and strong, multi-turn magnetic



**WORLD'S FIRST** 13.8-kv, 750-mva metal-clad switchgear is energized by C. P. Crane, Chairman and President, Baltimore Gas and Electric Company, in presence of utility and General Electric officials.

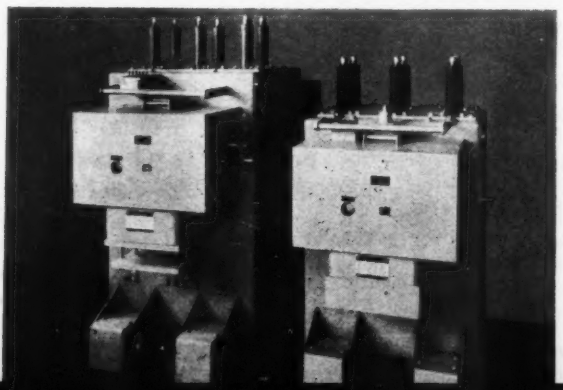
## Baltimore Gas and Electric Co. installs

# The first 750-MVA metal-clad switchgear

**TO PROVIDE FLEXIBILITY** for future expansion in the face of load growth problems, Baltimore Gas and Electric Co. took an historic step June 11, 1956, when General Electric's new 13.8-kv, 750-mva metal-clad switchgear was put on the line.

**EXTREMELY COMPACT**—G.E.'s new 750-mva unit packs 50 per cent more interrupting capacity in ten per cent more floor space than 500-mva equipment.

**50% HIGHER CAPACITY—ONLY 10% MORE SPACE.** 750-MVA breaker (left) as compared with 500-MVA equipment.



**SIMPLE TO MAINTAIN**—One man can handle the 750-mva Magne-blast breaker. Vertical lift design makes it virtually impossible to tip over. With double bus layout, feeder breakers can be removed without dropping load.

**FOR EXTRA SAFETY,** all circuit components are separately enclosed in grounded metal enclosures. Bus compartment, located at top of the unit, is least vulnerable to floods.

**MANY UTILITIES** face similar load growth problems. G.E.'s new 750-mva metal-clad switchgear points the way to a simple, low-cost solution. Contact your nearest G-E Apparatus Sales Office, or write for bulletin GER-1322—"The Economy of the 750-mva Breaker" to Section 511-18, General Electric Company, Schenectady 5, New York.

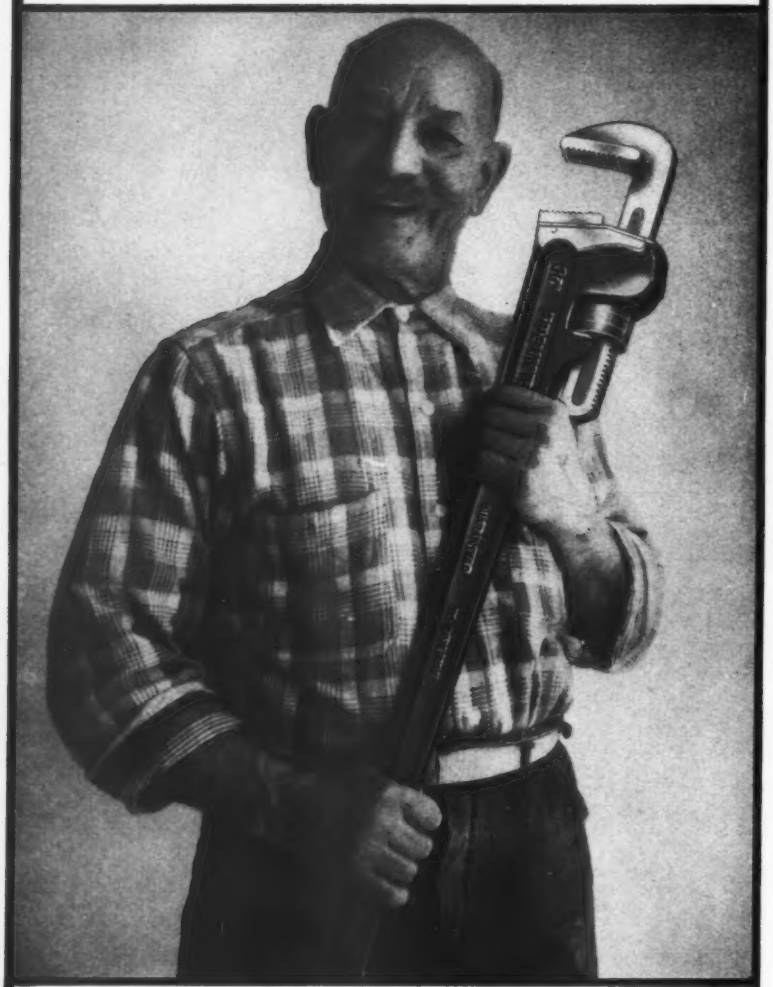
LIVE BETTER ELECTRICALLY

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

For more facts circle 627 on Reply Card

# PIPEMASTER



"I've been around pipes and pipe tools for the better part of a century! Long enough to give some advice. I want to tell you that there's no wrench like the Pipemaster wrench! Yessir! I've been using this wrench because it's *easier* to work with. The Pipemaster people thought up a kind of double-action spring that makes these jaws really grip and release. And, these balanced heavy-duty Pipemasters are lighter weight without sacrificing one bit of strength!"

You, too—look for Erie PIPEMASTER'S completely redesigned line of hand pipe tools—wrenches (all sizes from 6" to 48"), cutters, vises, stands, tubing cutters, and threaders. All parts of all Pipemaster tools are factory job-tested and unconditionally guaranteed. At your supply house or write:

ERIE PIPEMASTER

**ERIE TOOL WORKS**

**ERIE, PA., U. S. A.**

IN CANADA—ETF TOOLS Ltd. St. Catharines, Ont.

**For more facts circle 628 on Reply Card**


# NEW PRODUCTS

(Begins on page 170)

blowouts. Magnetic coils around each stationary contact either lengthen or compress arc, depending on direction of current flow at time of interruption, and cause arc to rotate. The constantly moving arc distributes effects of arcing over entire surface of both contacts, minimizing pitting, burning, and erosion, company notes, and extending contact life. Clark Controller Co.

## 60—STEAM TRAP fits existing piping layouts

Model FT-1 Float-Thermostatic Steam Trap is designed for a wide range of applications requiring high discharge capacity at pressures up to 25 psig. Said to represent a new design concept for this

type of trap, it features a discharge valve operation actuated by line pressure, rather than by float buoyancy. Valves and seats (separate discharge is provided for condensate and air) are of stainless steel and need not be changed for any pressure within the trap's range. A particularly advantageous design feature, according to company, lies in the fact that all internal mechanisms are attached to an easily removed cover plate, facilitating servicing. Unit readily fits into existing piping layouts by virtue of its dual inlets and outlets which permit universal installation. Small in size, light in weight, it is available for ¾- and 1-in. lines. W. H. Nicholson & Co.

**One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.**

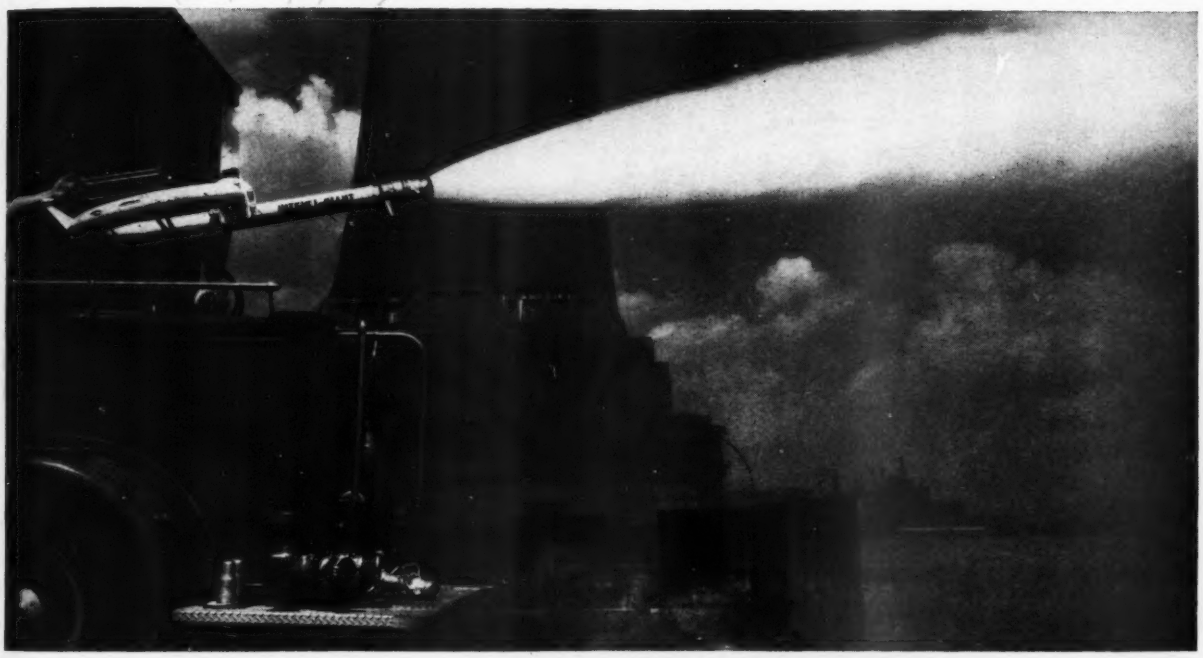
## 61—RUBBER-LINED PUMP handles acids and solvents

This rubber-lined side suction centrifugal pump is introduced for handling non-oxidizing acids and solvents detrimental

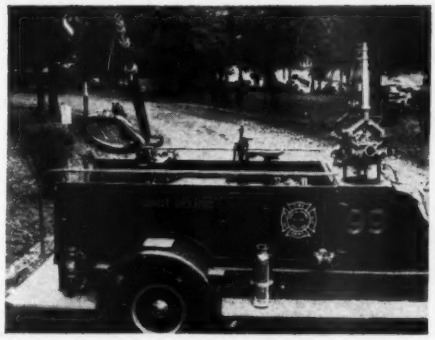
IN FIREFIGHTING—

# CHIKSAN Intelli-Giant...

## THE NEW BIG BERTHA OF FIRE SUPPRESSION



Capable of delivering a quenching 2,500 gallon per minute deluge, this latest development in master stream fire fighting equipment has a dramatically effective striking range of better than 320 feet in distance, a far-reaching 165 feet in height. Yet with all of its powerful striking force, one man seated at hydraulic controls has finger tip mastery of the Intelli-Giant at all times. Extremely versatile, the design of the Intelli-Giant makes it ideally suited for installation either on mobile equipment or as a fixed implacement in hazardous areas. "Modern Firefighting," a highly informative movie on the Intelli-Giant is available. Please write Chiksan, Brea, Calif. to arrange a showing.



Dispatched to combat a roaring mill fire on an island in the Schuylkill River, this Intelli-Giant, owned by the Philadelphia Fire Department, reached areas where conventional monitors could not. It prevented the inferno from engulfing 650 feet of the seven story building not yet affected by the fire.

*Photos courtesy Philadelphia Fire Dept.*

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

fmc

CHIKSAN

**Please Address: Dept. 221**

CHIKSAN COMPANY—BREA, CALIFORNIA • CHICAGO 5, ILLINOIS • NEWARK 2, NEW JERSEY

Well Equipment Mfg. Corp. (Division), Houston 1, Texas • Subsidiaries: Chiksan Export Company • Chiksan of Canada Ltd.

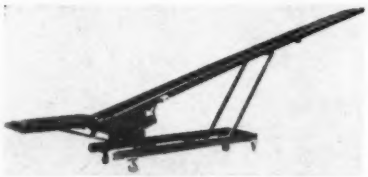
**For more facts circle 629 on Reply Card**

(Begins on page 170)

to standard fitted pumps. According to manufacturer, it handles lactic, maleic and sulfuric (to 50 per cent) acids, aluminum sulfate, sulfide, chloride and fluoride; calcium chloride, citric acid, copper sulfate, alcohol, formaldehyde, hydrogen sulfide and others without deterioration of pump's liquid end parts. The pump incorporates a rubber impeller and stainless steel (Carpenter 20) shaft. It is available as a motor-driven or belt-driven unit. The Deming Co.

## 62—BELT CONVEYOR has an elevating device

This portable belt conveyor comes equipped with a self-powered elevating device—a single-lever control adjusts the angle from horizontal to 45 deg. and a powered screw serves to automatically lock the conveyor at desired angle. Available as standard equipment on 20- and 22-ft length models, the lever controls a clutch mechanism which raises unit when belt moves in a forward position, lowers it when belt is reversed. The 14-in. wide 3-ply duck, rubber rough-top belt is designed to handle items up to 30 deg—for 30- to 45-deg operation, cleats are supplied. Conveyor has an extra long overhang on conveyor bed enabling upper end to be moved well into a truck, over a low balcony, or through a window. Capacity is 150 lb per package, or 300 lb fully distributed. The conveyor has a 115/230 v, 60 cycle, single phase motor and 20-ft power cord. Conveyor's frame is a steel reinforced box channel boom and all moving parts are enclosed. Elevated discharge height is 12 ft, 7 in. for the 22 ft unit. The Colson Corp.




GALVANIZE

after Fabrication?

Welding, cutting, shearing, punching, etc., leave exposed surfaces where rust has a chance to begin. If this work is done before Hot-Dip Galvanizing there will be no exposed surfaces. That's why we say—have your products Hot-Dip Galvanized after fabrication and there will never be a weak spot in your finished product.

Members of the American Hot-Dip Galvanizers Association have the know-how to do a top quality job. Write today for a list of our members and our STOP RUST booklet.

***Send for free booklet***

**American Hot-Dip Galvanizers Association, Inc.**
**1806 1st National Bank Bldg., Pittsburgh 22, Pa.**

Name_____

Firm_____

City_____ State_____

**For more facts circle 630 on Reply Card**


## 63—LUBRICANT DISPENSER is portable, hand-operated

This portable, manually-operated gear lubricant dispenser has a steel cover which can be clamped in 30 sec to any standard 25 to 50 lb original refinery container. It is designed for fast, clean refilling of transmissions, differentials, gear cases, final drives and other components, and includes follower plate to assure positive prime in handling even the heaviest gear lubricants in any weather, and 5-ft hose assembly with curved non-drip nozzle for easy application. Lubricant output: a pint per 10 strokes. It develops 400 lb maximum pressure. Bulletin 727 gives more details. Lincoln Engineering Co.

## 64—THERMOMETER is custom calibrated instrument

Unlike standard thermometers of its kind which cover a wide temperature range, and must necessarily operate within a limited accuracy, this new bimetallic unit is calibrated for 100 per cent accuracy, at any single desired point between –40 and 1000 F or between –10 and 300 C, manufacturer announces; there is no variation plus or minus. The dial housing measures $1\frac{1}{4}$ in., and the actual dial diameter is $1\frac{7}{16}$. Stem lengths from $2\frac{1}{2}$ to 70 in. can be furnished. The crystal is curved, and all parts (except dial, which is totally enclosed) are Type 304 stainless steel. Dial is black with white figures, red filled reference mark. W. C. Dillon & Co., Inc.

"DECIDEDLY BETTER"
DAY-BRITE
*Lighting Fixtures*

DAY-BRITE LIGHTING MAKES THE BIG DIFFERENCE HERE

## Precise work, fewer mistakes

Wherever precision work is all-important—in industrial plants and in offices—Day-Brite fixtures are definitely the first choice. They, too, are designed and built to precision standards that are immediately evident when you look at the fixtures, not just the pictures.

Make a point-by-point comparison of Day-Brite features with any other make. Your Day-Brite representative will gladly show you why Day-Brite is your best buy, from the first click of a switch through many years of continuous, uninterrupted service. Call him . . . Day-Brite Lighting, Inc., 5439 Bulwer Avenue, St. Louis, Missouri.

NATION'S LARGEST MANUFACTURER
OF COMMERCIAL AND INDUSTRIAL
LIGHTING EQUIPMENT

Section of drafting room, Salem-Brosius, Incorporated, Carnegie, Pa., lighted by Day-Brite.

71103

For more facts circle 631 on Reply Card

## New Plant Construction

(Continued from page 144)

facilities for the development of special chemicals at local operation here. Construction of new facility will start soon and is reported to cost upward of $500,000.

**Buffalo, N. Y.**—Ashland Oil & Refining Co., Ashland, Ky., has announced plans for addition of a 21-million gal per year aromatic chemicals unit to local refinery here. Unit will produce benzene, toluene, xylene and other petrochemicals. Construction work will begin soon and is scheduled to be completed by late 1957.

**Buffalo, N. Y.**—National Gypsum Co., 325 Delaware Ave., plans major expansion of company facilities in the Great Lakes area and will cost in excess of $19 million. Negotiations for plant sites at Waukegan, Ill. and Lorain, O. are nearing completion and plants will be erected on both sites for the production of gypsum products. Construction of the plants, docks and harbors will begin in the early summer of 1957.

**Harrisville, N. Y.**—St. Regis Paper Co., 75 E. 45th Street, New York, N. Y., has announced plans for a modernization program at local plant. Program estimated to cost in excess of $500,000 will add appreciable tonnage to uncoated bleached groundwood paper volume already being produced by the company's printing, publication and converting paper division. Work is to begin at once for completion in mid-1957.

**Canton, N. C.**—Champion Paper & Fibre Co., Hamilton, O., has announced plans for major expansion of company plant facilities here for increased production. A new two-story building will be erected with an area of 124,000 sq ft of floor space to house a new 220-in. paper machine to be placed in operation late in 1959. An attached four-story structure with 50,000 sq ft of floor space is planned to house the new machines' stock preparation equipment. Project will represent a multi-million dollar project.

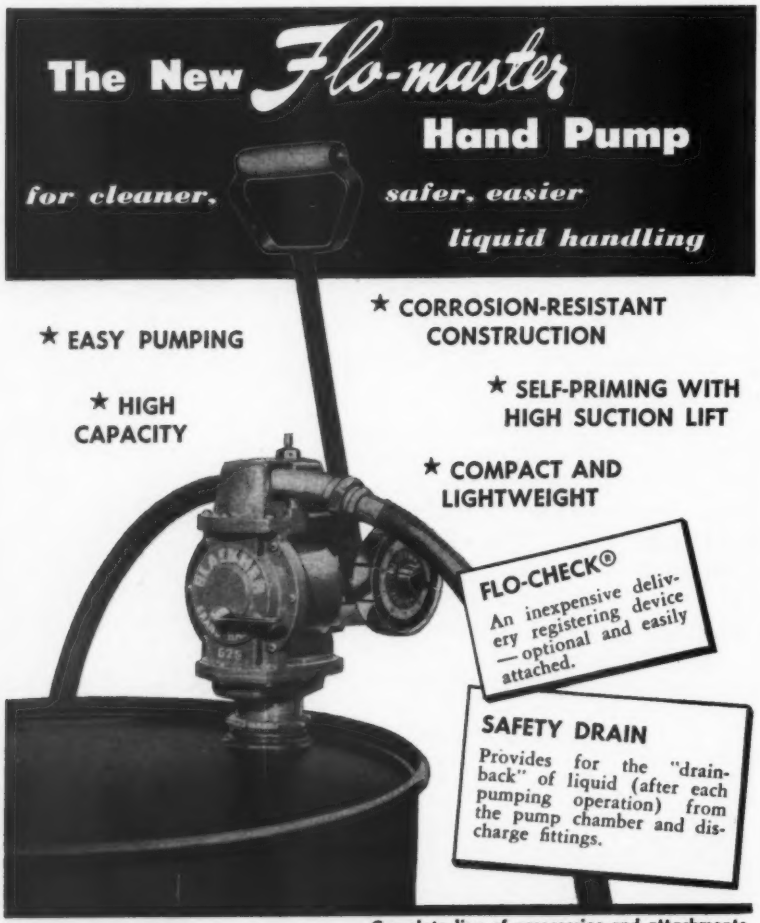
**Campbell, O.**—Youngstown Sheet & Tube Co., 1954 Stambaugh Building, Youngstown, O., plans major expansion of company's by-product coke facilities here. Company will add a third battery of 76-ovens for the production of coke and by-product, identical to the two already in operation at their Campbell Works. Addition is part of $250 million expansion program now in progress at various production centers of Youngstown.

**Toronto, O.**—Titanium Metals Corp. of America, owned jointly by National Lead Co., and Allegheny Ludlum Steel Co., has announced the purchase of Louis Berkman Company's Ohio River Steel Division plant here. Company has authorized expenditure of approximately $8 million for the installation of special rolling mills, vacuum annealing furnaces and new heat treating equipment. The mill will be used exclusively for the rolling and forging of titanium metal for use in advanced jet bombers, fighters and ballistic missiles.

**Wickliffe, O.**—Bailey Motor Co., 1050 Ivanhoe Ave., Cleveland, O., has announced plans for company expansion and addition to local plant here. Company will erect a two-story brick and steel addition to plant facilities at Worden Rd. and Euclid Ave., for the production of meters and control systems for power plants and various industrial processes. Plant improvements and additions are expected to cost about $750,000.

**Butler, Pa.**—Armco Steel Corp., 1939 Armco Ave., Middletown, O., plans a major expansion and improvement program at local plant here. Program estimated to cost about $55 million is designed to meet the growing demand for company's stainless steel for military aircraft and guided missiles.

**King of Prussia, Pa.**—Automatic Temperature Co., Inc., 5200 Pulaski Ave., Philadelphia, Pa., has announced plans for the erection of new plant for the manufacture of automatic valve operators, timers and control equip-



The New Flo-master Hand Pump
for cleaner, safer, easier liquid handling
★ EASY PUMPING
★ HIGH CAPACITY
★ CORROSION-RESISTANT CONSTRUCTION
★ SELF-PRIMING WITH HIGH SUCTION LIFT
★ COMPACT AND LIGHTWEIGHT
FLO-CHECK®
An inexpensive delivery registering device — optional and easily attached.
SAFETY DRAIN
Provides for the "drain-back" of liquid (after each pumping operation) from the pump chamber and discharge fittings.

Complete line of accessories and attachments

"liquid materials handling"® equipment

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INDUSTRIAL, HAND AND TRUCK PUMPS, STRAINERS, PRESSURE CONTROL VALVES

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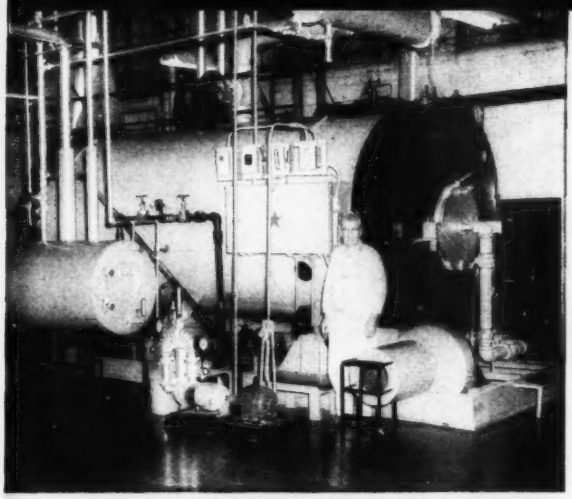
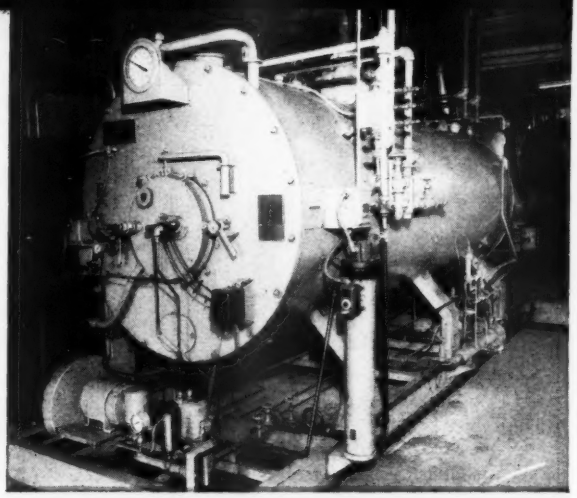
For more facts circle 632 on Reply Card

# Some Typical Steam Problems Solved by AMESTEAM GENERATOR



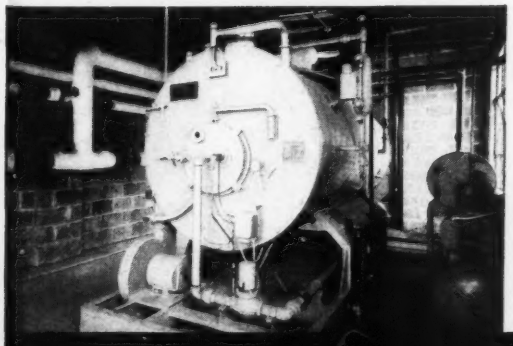
**"... EXTREMELY VARIABLE STEAM DEMAND HANDLED SMOOTHLY AND EFFICIENTLY"** at St. Joseph Paper Company, Houston, Texas. Writes C. J. Christman, Plant Engineer:

"We have an AMESTEAM GENERATOR, 300 HP, 150# W. P. in our plant. It has been in operation since January, 1949. We have an extremely variable steam demand, but this boiler handles it smoothly and efficiently. Practically all the original equipment is still in use and in first-class operating condition. We have never had a leak in our boiler or pipe installation during seven and one-half years of uninterrupted service. The boiler is economical, maintenance costs are very low, and we are completely satisfied."



**"... BEST DOLLAR INVESTMENT WE HAVE MADE TO DATE,"** reports Scranton Wiping Cloth Company.

"... of all the equipment we purchased last year to completely equip our new laundry facilities, which include your 150 HP heavy oil, high pressure automatic AMESTEAM boiler," writes company official L. Light, "we can honestly state that the performance of this piece of equipment has been such that we now consider it the best dollar investment that we have made to date. From a fuel standpoint alone, our records indicate that it is costing us 51.7c per thousand pounds of steam ..." (not counting the maintenance labor savings enjoyed by this firm!).



**"VERY SATISFACTORY"** on lumber dry kilns is the report by J. S. Gudmundsson, Director, Foreign Trade Division of Wood-Mosaic Corporation, describing performance of the AMESTEAM GENERATOR at the firm's New Orleans yard.

"The AMESTEAM GENERATOR we have there for running our lumber dry kilns hes operated very satisfactorily, and we would specifically like to comment on the very excellent service that your representative has given us."

## WHAT'S YOUR STEAM PROBLEM?

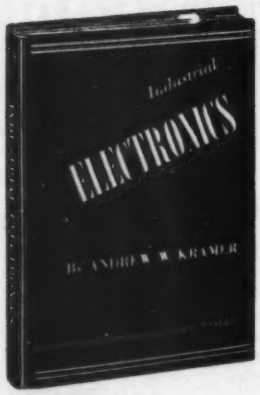
If you need 10 to 600 HP and want the kind of space-saving, trouble-free service enjoyed by these owners of AMESteam Generators, write today for our catalog and the name of your nearby Amesteam dealer.

**AMES IRON WORKS INC.**

BOX M-17 OSWEGO, N. Y.

For more facts circle 633 on Reply Card

a practical book about Electron Tubes




what they are

how they work

how they can be used

what they can mean to you

# INDUSTRIAL ELECTRONICS

by Andrew W. Kramer

This book explains in clear, simple, non-technical style the basic principles of electronics, and how these principles can be applied in industry. Electronics has been solving the unsolved problems. Whether it is navy beans, opening doors at a shadow, or measuring the thickness of red-hot steel plates, the electron is the newest and most efficient force captured by science. This book should be invaluable for the practical maintenance or operating executive or engineer. 311 pages, 229 illustrations, $6.00.

CHAPTER HEADINGS: Electron Behavior, Fundamental Principles of Electron Tube. The Simplest Thermionic Tube—the Diode. The Triode. Further Aspects of Triode Characteristics and Operation. Electronic Generation of Electric Oscillations. Multielement Tubes. Effect of Gas in a Tube. Types of Characteristics of Gas-filled Tubes. Mercury-pool Tubes. Photoelectric Tubes and Cells. Cold-cathode Tubes. Special-purpose Tubes. What Tubes Can Do. Electronic Control and Regulation. Application of Electron-tube Rectifiers. Electronics in Instrumentation and Measurement. Industrial Applications of Electronic Control. Application of Electronic Regulation. Electron Tubes in Light Production. Miscellaneous Electronic Applications.

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**PLANT ENGINEERING**

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ment. Company plans to consolidate operations under one roof when plant of 70,000 sq ft is completed sometime next year. Construction will get under way late this year and plant will cost an estimated $700,000 when completed.

**Calhoun Falls, S. C.**—Bigelow-Sanford Carpet Co., Inc., 138 Madison Ave., New York, N. Y., has announced plans for the construction of new modern carpet wool preparation and yarn making plant. Construction will get under way at once and plant is scheduled to begin operation in the summer of 1957.

**Bishop, Tenn.**—Celanese Corp. of America, Plastics Division, 180 Madison Ave., New York, N. Y., has authorized plans and construction is already under way on new polyol unit at local plant site. New unit will be completed and ready for production by the last quarter of 1957.

**Fort Worth, Tex.**—General Mills, Inc., 400 Second Ave., Minneapolis, Minn., has announced plans for the construc-

tion of a push button feed mill. Construction of the mill will get under way at once and plans call for completion by early 1958. Plant, featuring electronic and automatic controls, will produce poultry and livestock feeds in mash, pellet, crumbled or cubed form.

**Nacogdoches, Tex.**—Basson Industries Corp., 1424 West Farms Rd., New York, N. Y., plans to construct a branch plant here for the manufacture of plastic- and Teflon-insulated wire and cable products for construction, communications and aircraft missiles. In addition company will turn out plastic pipe for irrigation purposes and for oil and chemical transmission.

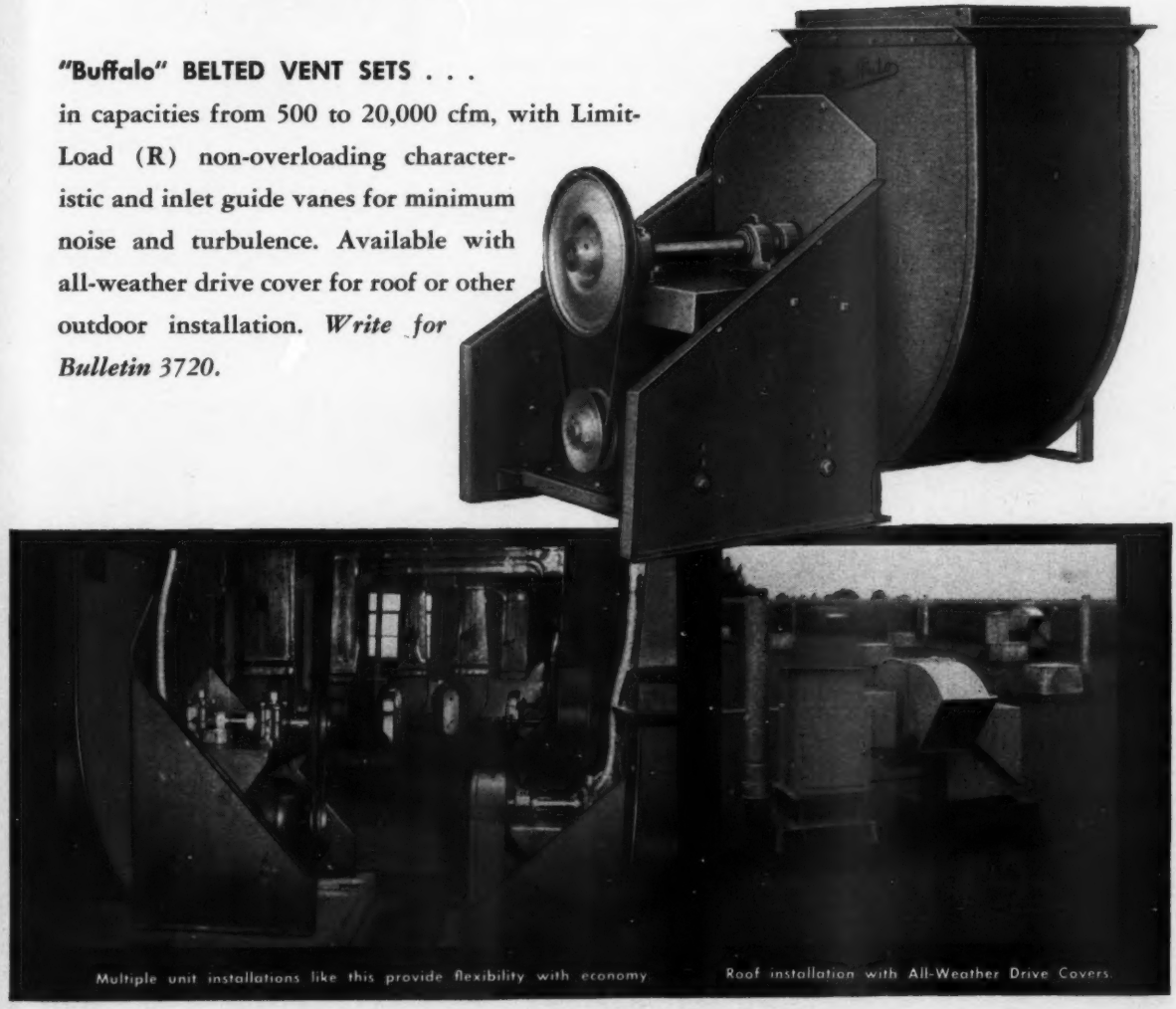
**Port Arthur, Texas**—Texas Co., Chrysler Towers, New York, N. Y., has authorized construction of a new catalytic cracking unit with a daily capacity of 90,000 bbl at local refinery here. Site preparation is already in progress and construction is scheduled to begin early in 1957.

**Ferndale, Wash.**—General Petroleum Corp., subsidiary of Socony Mobil Vacuum Oil Co., 612 So. Flower St., Los Angeles, Calif., has announced plans for the expansion of company's refinery and facilities here. Refinery capacity will be increased to better than 48,000 bbl daily at a reported cost of between $6 and $8 million. A new reformer is currently being installed at a reported cost of $7 million.

# VENTILATING FANS

- for easy, "package" installation
- that are lightweight and compact
- that are unusually quiet and efficient
- for indoor or outdoor installation
- with capacity that's adjustable any time

**"Buffalo" BELTED VENT SETS . . .** in capacities from 500 to 20,000 cfm, with Limit-Load (R) non-overloading characteristic and inlet guide vanes for minimum noise and turbulence. Available with all-weather drive cover for roof or other outdoor installation. *Write for Bulletin 3720.*



Multiple unit installations like this provide flexibility with economy.

Roof installation with All-Weather Drive Covers.

**BUFFALO FORGE COMPANY**

**BUFFALO, NEW YORK**

*Canadian Blower & Forge Co., Ltd., Kitchener, Ont.*

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING
FORCED DRAFT COOLING HEATING PRESSURE BLOWING

**For more facts circle 635 on Reply Card**

# YARWAY picked for "Preferred" Steam Generators

This installation of Preferred Utilities Mfg. Corp. packaged unit steam generators at a high school in New York State features YARWAY Blow-Off Valves as part of the "package".

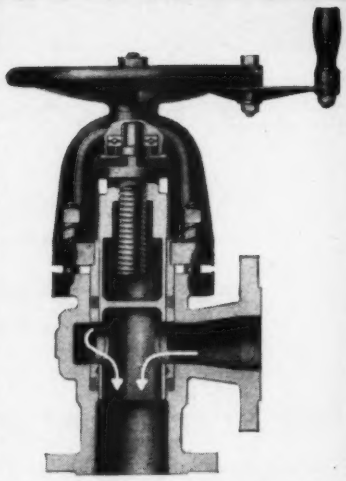
Not only Preferred Utilities, but many other leading manufacturers of package-type boilers now furnish YARWAY Blow-Off Valves on their units. YARWAYS make a *good* package boiler *better*.

The YARWAY Seatless Valve gives drop-tight shut-off and also eliminates the commonest source of blow-off valve trouble. *There is no seat to score, wear, clog or leak.*

Whatever make boiler you use, specify that the blow-off valves be YARWAY *Seatless*. More than 16,000 boiler plants use YARWAY Blow-Off Valves—some for 35 to 40 years.

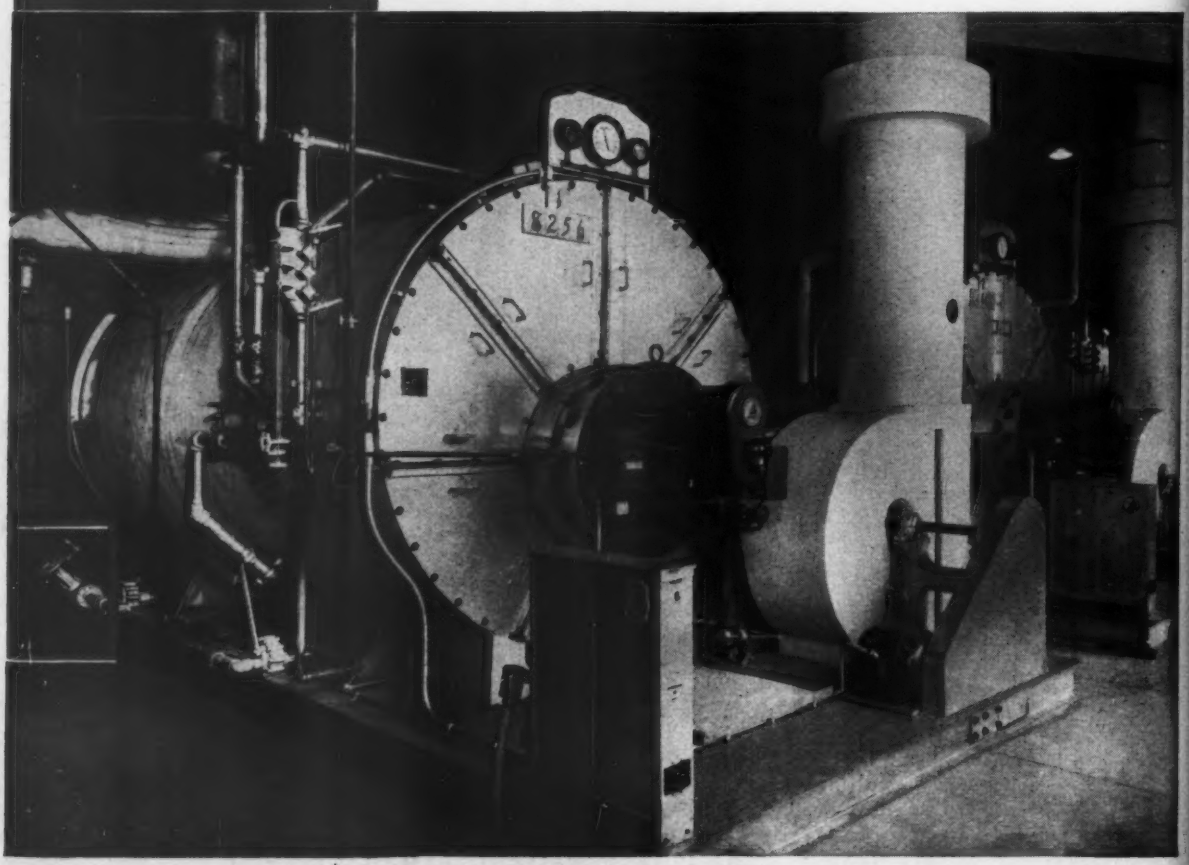
Write for full details in Yarway Bulletin B-426.

**YARNALL-WARING COMPANY**
145 Mermaid Ave., Philadelphia 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES



Yarway Type "B" Seatless Blow-Off Valve shown in open position. Note balanced, sliding plunger design. There is no seat to score, wear, clog or leak. Pressures to 400 psi.

YARWAY **BLOW-OFF VALVES**



For more facts circle 636 on Reply Card

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**JANUARY, 1957**
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Your Company Name .....

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### PRODUCTS

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### ADVERTISED PRODUCTS, SERVICES

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**JANUARY, 1957**
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### ADVERTISED PRODUCTS, SERVICES

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# BULLETINS

(Begins on page 21)

**157** **Plastic Pipe**—Chemical-resistant plastic pipe, fittings, and valves are described in 8-pp Bulletin CE-56, which includes technical properties, a table of resistance to chemicals, data on sizes, pressures, dimensions, and prices for pipe, fittings, and valves from ½ to 2 in. Instructions for threading, forming, and other installation operations are also given. American Hard Rubber Co.

**158** **Tube Fittings**—Advantages and applications of butt joint tube fittings designed for speed and simplicity of installation are described in 24-pp Bulletin 3061. Component features are illustrated and described and recommended maximum working pressures and other technical specifications are tabulated, with photos and dimensional drawings included. The Imperial Brass Mfg. Co.

## TOOLS, WELDING AND MACHINE SHOP EQUIPMENT

**160** **Electric Tools** — Portable electric tools and kits with over 400 accessories for builders, carpenters, plumbers and electricians are described and illustrated in 32-pp Catalog 104. Includes over 150 pictures of tools and their uses with complete specifications for electric saws, sanders, drills, planes, routers, shapers, combination tools, grinders, hedge shears and grass trimmers. Porter-Cable Machine Co.

**161** **For Arc Welding**—"Power Supplies for Gas Shielded Metal Arc Welding" is a 12-pp article detailing a study indicating that a constant-voltage transformer-rectifier with automatic regulations for fluctuations in line voltage is the best general purpose machine for the inert-gas-shielded metal arc welding process. Typical volt-ampere characteristics of various types of power sources are shown on graphs, welding characteristics discussed, and welding changes caused by line-voltage drift with various arc regulations. Air Reduction Sales Co., Div. of Air Reduction Co., Inc.

**162** **Air Hammers**—This data and price catalog sheet covers company's Series IP straight impact hand model air hammers. Pictures, gives parts and prices as well as brief specifications on models 100, 200, 300 and 400 hammers for rivet capacities ⅛ in. through ¼ in. Lemert Engineering Co., Inc.

**163** **Tube-Working Tools**—Catalog 1140, 24 pp, covers company's hand tools—tube cutters, flarers, benders — also bench-mounted benders, power flarers, straight thread tapping and counter-boring tools. Includes a section on how to use the tools, as well as photos, and specifications. Parker Appliance Co.

**164** **Metal Finishing Wheel** — This 12-pp illustrated booklet describes PG (polishing and grinding) wheel applications in case history form, and covers actual wheel applications in appliance, aircraft, farm equipment, metal furniture, dairy equipment, machinery and other metal working industries. Photos of applications are included. Minnesota Mining and Manufacturing Co.

**165** **Gear Shaving Cutters** — Bulletin CR-56-10, 12 pp, deals with care and use of gear shaving cutters. Included in the profusely illustrated manual are cutter specification tables; mounting instructions and data on speeds, feeds, coolant, cutter life, sharpening, storage, repair procedures, as well as ordering information, application data, and a table of recommended tooth thickness stock allowances for gear shaving. National Broach & Machine Co.

**166** **Cut-Machining Units**—This 44-pp book describes briefly the various types of abrasive cut-off saws available, including a portable combination cut-off and deburring chop saw, a modular cut-off saw, a swing type cut-off saw for high production work, and a rotating cut-off saw having 12 in. pipe capacity, as well as portable hacksaw and bandsaw. Photos show tools in use. Wallace Supplies Mfg. Co.

**167** **Machinery Mounts**—Pad type machinery mounts that eliminate bolting and shimming are described in illustrated Bulletin K2D. Gives complete information on properties of Elasto-Rib and the dampers incorporating this material as isolation medium. Construction and installation diagrams of dampers, and dimension and loading capacity tables are included. The Korfund Co. Inc.

## MATERIALS HANDLING

**168** **Gas-Powered Trucks**—Catalog 5101D, 22 pp, covers in detail the various models in company's "integrated design" line of gasoline and LP-Gas powered industrial lift trucks. The booklet includes key features and specifications on trucks from 2000 to 10,000 lb in capacity with cushion or pneumatic tires and with torque transmission, fluid coupling or straight disc clutch. Details are also given for special trucks such as stevedoring models, cotton and textile trucks, dust protected trucks, others. The Yale & Towne Mfg. Co.

**169** **Electric Fork Truck**—Form B-578 illustrates and describes a 6,000-lb capacity electric powered fork truck designed to provide maximum economy and efficiency. Illustrations and detailed specifications are included. The Elwell-Parker Electric Co.

**170** **For Snow Removal** — Form MS-1147 describes a wide range of snow removal equipment for a variety of snow removal jobs, including "V" plows, wings, blade plows, loading buckets and bulldozer blades. Size and capacity data provided. Allis-Chalmers Mfg. Co.

**171** **Innerlocked Belting** — This loose-leaf notebook contains information on company's innerlocked belting and accessories for conveying, elevating and transmission applications. Describes construction features and advantages, as well as applications, operation features, and pictures typical installations. A guide to maximum belt life, complete technical data and a price list are included. Imperial Belting Co.

### Among This Month's New Literature of Merit . . .

**173** **Prescribed Lighting** — This 28-pp booklet, "Prescribed Lighting Protects the Eyes of Industry," features safety and visibility factors; standards for use in prescribing plant lighting; uses of fluorescent, incandescent and mercury vapor lamps; lighting of other areas; maintenance; data on fixtures. Discussing lighting as a production tool, booklet outlines related visibility factors of size, contrast, time and brightness, and lists 10 advantages gained from improved lighting. Sylvania Electric Products Inc.

**174** **For Low Temp Welding**—Theory and application of the low heat input metal-joining process are covered in 56-pp Manual TIS 2572, including latest low temperature welding alloys. Features illustrations, diagrams, and covers such subjects as torch manipulation, angle and distance as well as improved electrode control for metallic arc welding. Torch and arc generator settings are detailed for all metals and techniques such as back-up and chill bars for stainless steel welding are illustrated. Weld preparation, finishing and jig-saving welding accessories are presented, and special techniques, are described. Eutectic Welding Institute, Eutectic Welding Alloys Corp.

**175** **Wires and Cables**—Interlocked armored cable, supports and fittings designed for low cost, heavy duty industrial, power or control wiring are described in this 24-pp bulletin. Photos and specific descriptions of various types of armored cables available for voltages through 15,000 v, single and multi-conductor are included. Arranged in table form are dimensional data, including conductor size, stranding, insulation, sheath and armor thickness, outer diameter and weight. Pertaining to fittings, charts show cable range, size requirements, catalog numbers. National Electric Products Corp.

**176** **Abrasive Selection**—Bulletin 333, 12 pp, covers blast cleaning abrasives—their characteristics, application and selection. It details methods for improving, cleaning quality and cutting production costs in foundry, descaling, mold and die, shop maintenance, decorating and carving, part reclamation and finishing operations. Selection of proper type and size of abrasive is stressed, properties and characteristics of abrasive given, and tables of specifications included. Pangborn Corp.

On the facing page are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

## WATER, WASTE TREATMENT

**177** **Zeolite Softeners**—Twenty-pp Publication 4520 deals with necessity for water softening, explaining fundamentals of softening and selection of equipment and zeolites. Also describes operation of company's Hydromatic single control valve for manual or automatic control of process cycling. Cochrane Corp.

**178** **For Continuous Blowdown** — Bulletin 65 describes a continuous blowdown system designed to maintain proper boiler water concentrations. A drawing showing components is included, advantages are listed, and physical details given. The Whitlock Mfg. Co.

**179** **Plating Wastes Disposal** — This illustrated article on precipitation and filtration offers a practical solution to plating waste disposal problems. The literature compares various methods of waste disposal and discusses methods of handling waste from a typical plating operation. Filtration equipment, filter sizing and costs are also discussed. Filtration Engineers, Inc.

**180** **Water, Waste Treatment** — Latest results in water, waste and sewage treatment entailing use of Separan 2610, a high speed flocculating agent, are reported in two booklets. The first offers data showing how Separan 2610 has improved clarity of treated water, increased solids settling rate, improved throughput of existing equipment, and decreased treatment costs. Methods of solution preparation and use are given. The other booklet tells how by using Separan metal finishing, wastes handled on a batch basis in a 45,000 gal tank were settled in a third to a fifth of the time previously required. The Dow Chemical Co.

**181** **Solids-Contact Reactors**—Bulletin 5001, 24 pp, features a cut-away photo showing internal construction of company's solids-contact reactor, and includes plan and elevation drawings covering variety of designs available. Discusses theory and problems of cold water clarification, as well as advantages and applications of different designs. Also provides section on auxiliary apparatus. Cochrane Corp.

## MATERIALS, PRODUCTS

**182** **Solution Resins**—This folder contains a series of bulletins on solution resins, covering six Exon vinyl chloride resins for solution coatings. Outstanding characteristics of each resin are described and a graph showing the solubilities of these resins in methyl ethyl ketone is included. Solution viscosity tables, data on formulating and other information included. Chemical Sales Div., Firestone Plastics Co.

**183** **Epoxy Resin Adhesives** — This 11-pp technical bulletin gives engineering data on high strength epoxy resin adhesives for metal to metal bonding and honeycomb sandwich construction. Contains information on five representative epoxy resin adhesives, details applications, properties and performance characteristics, application and curing procedures. Minnesota Mining and Manufacturing Co.

**184** **On Silicone Products**—In this 12-pp 1957 Reference Guide are described almost 150 commercially available silicone products, including several developed within the year. Products are grouped by usage (water-repellents, dielectrics, release agents, etc.), to help you locate a material by what it does, as well as by what it is. Descriptions are brief and factual, with emphasis on charts, tables and graphs comparing various silicones with materials they are displacing. Dow Corning Corp.

**185** **Plastic Fabrications** — To help you choose the right plastic for any job, this 16-pp revised 1957 condensed reference file covers distinguishing characteristics, appropriate fab-

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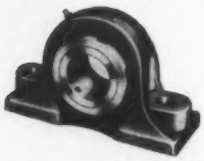

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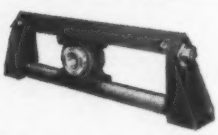

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# BULLETINS

(Begins on page 21)

ricating technique, and major fields of application for polyethylenes, vinyls, phenolics, styrenes, epoxies and polyesters. Photos and sketches illustrate typical applications and handy chart indicates variety of plastics by major methods of fabrication, such as bonding, laminating, molding, extrusion, calendering, film and sheeting, surface coatings and flexible packaging materials. Bakelite Co. Div. of Union Carbide and Carbon Corp.

**186** **Corrosion Resistant Equipment**—Catalog C-14, 32 pp, contains complete information on company's line of corrosion-resistant plastic equipment, including pipe and fittings, valves; fume ducts and fume systems; tanks, towers and accessory supplies; heat exchangers; pressure and vacuum equipment; and agitators. The booklet also includes data on chemical-resistant cements, the field construction of plastic equipment, and company's design service. Haveg Industries, Inc.

**187** **Processing Equipment**—This 32-pp report is designed to help with cost estimation, and selection of this company's impervious graphite processing equipment. Each piece is shown in a drawing or illustration, all standard models listed, and detailed costs furnished. Report covers heat exchangers of the tube and shell, cubical, cross-bore, plate and bayonet types, as well as cascade coolers, towers, centrifugal pumps, pipe, fittings, others. A chemical resistance chart is included, together with outline of properties and characteristics of Impervite. Falls Industries, Inc.

## LUBRICATION

**188** **Silicone Lubricants** — Eight-pp Code 6-101 is a comprehensive brochure describing company's silicone lubricants available in quantity. Properties and performance of various silicone oils, greases and compounds are discussed, and typical applications listed and illustrated. Attention is given to high speed, high temperature ball bearing problems; relative influence of bearing load, speed, metal combinations explained. Dow Corning Corp.

**189** **Lubricant Additive**—Bulletin Lu-6, 12 pp, describes Moly-Sulfide lubricant additive designed to extend effective lubrication with a low-friction film. Summarizes lubricating characteristics of Moly-Sulfide-containing lubricants, describes advantages, and details applications, as well as results of field and laboratory tests for each application, and chemical and physical properties. Climax Molybdenum Co.

**190** **Machine Lubrication** — Automatic and semi-automatic centralized lubrication systems for a wide range of small machines are described and illustrated in 24-pp Bulletin 4C. Covers company's line of cyclic and one-shot lubricators. Discusses factors to be considered in selection of lubricator for a specific machine. Generously illustrated with photos, drawings, specification tables, booklet also includes sections on meter units and installation details. Bijur Lubrication Corp.

## OTHER EQUIPMENT

**192** **Steel Storage Equipment** — Reference Manual 485 is the 48-pp 1957 buyers' guide to this manufacturer's line of steel equipment. Presents all types of steel shelving, bins, drawers, lockers, work benches and tables, and other office, warehouse and shop equipment, including trucks. Fully illustrated, booklet shows features of each item, and provides dimensions, suggestions for use. Price list is included. Equipto Div., Aurora Equipment Co.

**193** **Engine Applications**—The first four of a series of engine case histories covering company's line of engines are offered in these four bulletins. Case histories include pictures and drawings to illustrate applications using the V-8 and V-12 engines of 540 to 4000 cu in. size. Applications described include air conditioning, gas boosting and others. Le Roi Div., Westinghouse Air Brake Co.

**194** **Boiler-Burner Units** — Bulletin ID-56-215, 8 pp, details specifications for a line of packaged firebox boiler-burner units engineered for 4-pass fire travel and automatic operation with oil or gas or oil-gas combinations. Installation and operation advantages are illustrated and a large cutaway view showing component features is included. York-Shipley, Inc.

**195** **Fire Alarm Systems** — Bulletin F249 describes 26 component panels utilized in company's fire alarm systems, together with their associated parts. Photos and descriptions of the various components are included, along with information on operation and applications, and specification details. The Gamewell Co.

**196** **For Shell Molding**—"Plaskon Resins for Shell Molding," 32 pp, describes shell molding process for casting metals. Includes design and production considerations such as cost; available types of molding machinery and selection factors; gating techniques and precautions; pattern design; resin bonding of shell molds; special metals handling; and sand reclamation. Detail drawings and sketches show representative shell molding machinery, typical pattern designs and techniques. Barrett Div., Allied Chemical & Dye Corp.

**197** **For Simpler Paperwork**—Quotation requests, purchase orders and receiving reports are being typed automatically from punched tapes, for substantially increased departmental efficiency according to 24-pp No. 43, third quarter issue of "Paperwork Simplification." Some case histories describing self-perpetuating data systems in use are provided, along with stories of other methods and systems aimed at work simplification. The Standard Register Co.

**198** **Metal Laminates**—Types of metal laminates, metals which can be laminated, and applications in heat exchangers, automotive, appliances, and electronics are detailed in this illustrated 8-pp bulletin. Advantages and properties are described, and size and other data given. Bridgeport Brass Co.

**199** **Humidification Facts** — Bulletin 492 offers pertinent facts on the subject of humidification for industry. Lists advantages of controlled humidification and describes various types of humidifiers to suit a variety of industrial requirements. Abbeon Supply Co.

**200** **Wood Drying System**—Bulletin 1232, 8 pp, describes the Dryalator, a packaged device for automatically drying lumber for use by lumber and furniture manufacturers and for producers of products which incorporate components made of wood. Illustration showing equipment, with pneumatic recording control, steam heating coils, and instrumentation are provided, as well as operating views of the kiln. Orr & Sembower, Inc.

**201** **Need a Conversion Chart?**—Easy-to-read tables of Fahrenheit and Centigrade temperature equivalents are shown on this handy pocket-size chart. Its reverse side illustrates, by means of an animated demonstration, the easy reading qualities of thermometers made with company's glass red reading column. The Moeller Instrument Co.

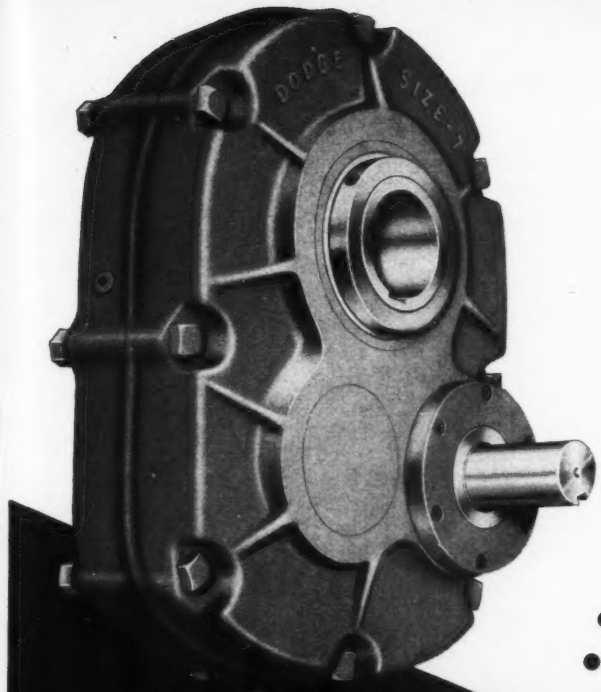
**202** **Troubled with Starlings?**—A 12-pp illustrated case histories bulletin tells how the use of the tape recorded starling distress call harmlessly rids buildings of these bird pests. Mohawk Business Machines Corp.

**203** **Desuperheater** — Bulletin 1024 describes capabilities and specifications of company's desuperheater which applies a new, but well-tested principle to reducing high steam temperatures. Operational features are described and illustrated with cutaway views and complete specifications are included. Copes-Vulcan Div., Blaw-Knox Co.

**204** **Insulated Stack**—This illustrated folder on company's pre-cast insulated stack contains complete product information, including advantages and description, specifications, suggested installation methods. Van-Packer Corp.

**205** **Wire Screen**—Bulletin 10 is an illustrated folder which combines a brief history of the company with partial cataloging of the most popular wire screen items. Booklet "folds-out" into a large chart showing complete wire screen specifications. The Cleveland Wire Cloth and Mfg. Co.

**206** **Heavy Duty Positioner**—Bulletin R-1700-S17 is a specification sheet on company's precision engineered heavy duty Model 240 welding positioner, which includes specifications, general description, and photos. Typical applications are shown. Worthington Corp.

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**STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided for you on pages 219-220.**

## VALVES, TRAPS, PIPING AND ACCESSORIES

**301** **Bronze Valves**—Globe and angle bronze valves with rising stems, union bonnets and stainless steel plug type seats and discs are described in this bulletin. Discusses design advantages, gives dimensions. The Walworth Co.

**302** **Diaphragm Valves** — Catalog V-55, 34 pp, covers operation, installation and selection of diaphragm valves for handling of acids, alkalis, gases, volatile and viscous substances, water and other fluids, compressed air vacuum, slurries, semi-solids, beverages and food products. Diaphragm materials are described, selection tables included. Hills-McCanna Co.

**303** **Lubricated Plug Valves**—Catalog PV-4, 36 pp, shows in detail a line of iron and steel lubricated plug valves. Many illustrations of single, screwed and bolted gland type valves are shown, including photos, sectional and detailed drawings. Also included is physical data on dimensions, ratings. The Wm. Powell Co.

**304** **For Quick Valve Selection** — Here's a 20-pp catalog digest providing ordering and application information, on gate, globe, angle and check valves in bronze, iron, cast and forged steel construction, also valve accessories and parts. Illustrated, includes pressure-temperature chart. The Ohio Injector Co.

**305** **Valve Performance Facts** — Included in this 36-pp booklet are 32 case histories of cost-saving valve installations. Service applications covered include steam, oil, water, coating fluid, chlorine, phenol, pulp stock, vacuum, others. Industries include paper mills, refineries, central stations, other plants. Crane Co.

**306** **High Pressure Valves**—Bulletin B-451, 12 pp, contains complete engineering data on company's valves for high pressure and high temperatures. Typical installations are pictured, dimensions and weights are tabulated, and temperature-pressure ratings are shown. A selection table is included, as well as information on materials, design. Yarnall-Waring Co.

**307** **Valve Data**—This loose-leaf notebook contains a collection of company's bulletins on its line of valves for control of air, gas, liquids and solids. It features complete operating, design, dimensional and specification data on butterfly, slide, automatic and proportioning valves, and is profusely illustrated with photos, drawings and diagrams highlighting valve design. W. S. Rockwell Co.

**308** **Control Valves**—Air and hydraulic control valves designed for high-speed, rugged performance are the subject of 6-pp Bulletin 561. Advantages are pointed out and a number of different models are illustrated, including single solenoid valve, double solenoid valve, pilot operated valves, and lever operated valves. A drawing illustrates design and construction features. C. B. Hunt & Son, Inc.

**309** **Water Hammer Control**—Cause, effect and control of water hammer in piping systems is the subject of 8-pp Bulletin WH 851. Photos, drawings and curves supplement text, and test data is presented to show efficiency of company's silent check valves in water hammer control. Some typical installations are illustrated. The Williams Gauge Co., Inc.

**310** **Steam Trap Solutions**—Bulletin F-151, titled "Solving Steam Trap Problems," is a 36-pp illustrated booklet giving specifications and capacities of steam and float traps, air release valves, pipe line strainers. Tells how to calculate condensation loads and select traps for unit heaters, jacketed kettles, submerged surfaces. Gives pointers on installing and servicing traps. Also included in this edition is information on combination flat and thermostatic traps. The V. D. Anderson Co.

**311** **Steam Trap Book**—Catalog J is a 44-pp manual and ordering guide in which 17 pp are devoted to data on fundamentals of good trapping and trap selection. Installation and maintenance instructions are also provided. Book lists steam traps for maximum pressures of 250, 600, 900, 1500 and 2500 psig. Included, also, is a section on trouble shooting. Armstrong Machine Works.

**312** **Steam, Air and Gasoline Traps**—Catalog 751, 32 pp, is a trap ordering book with capacity tables, installation diagrams, and containing charts and formulas for determining proper size trap for specific applications. Covers thermostatic steam traps, expansion steam traps, weight-operated traps for steam, air, gasoline, pressure up to 1500 lb. W. H. Nicholson & Co.

**313** **Unions, Check Valves**—Illustrated Catalog 55, 24 pp, describes and provides ordering information on a line of forged steel unions and check valves. Socket-weld, high-speed, orifice., Q-ring and other unions are included. Catalog provides service recommendations, dimensions and list prices. Also included is table covering discharge of water to atmosphere. Clayton Mark & Co.

**314** **Coupling Data**—Bulletin 240 describes a quick-connect, quick-disconnect H coupling, its uses and construction, with particular reference to U-packer which gives positive seal without compression set because of rubber distortion. A fully detailed cutaway of coupling is included and dimensions and ordering information given. Snap-Tite, Inc.

**315** **Improved Hose Coupling**—A quick connect-disconnect hose coupling for water, oil, steam, gas and chemical lines is described in this 16-pp bulletin. Describes the coupling's construction and explains how it provides a sealing action which makes the coupling tighter as internal pressure increases, and a full swiveling action that prevents hose twisting and kinking. Titeflex, Inc.

**316** **PVC Pipe Fittings, Flanges**—This is a comprehensive 12-pp catalog on corrosion resistant pipe fittings and flanges in normal- and high-impact grades, rigid, unplasticized polyvinyl chloride. Shows characteristics, advantages and limitations. Lists operating pressures, temperatures, applications, price comparisons, fabrication advice, installation and supporting recommendations, dimensions and weights. Grinnell Co., Inc.

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**317** **Jointed Clay Pipe**—Advantages of jointed vitrified clay pipe designed to limit and control leakage of ground water in sanitary systems are described in this illustrated bulletin. Performance characteristics are discussed and typical installations are pictured. American Vitrified Products Co.

**318** **Pipe for Modern Buildings**—This 16-pp booklet discusses wrought iron pipe for modern buildings. Identifies wrought iron pipe and describes composition and advantages. Included are sections on wrought iron's resistance to corrosion and fatigue stresses, weldability, forming and threading, as well as the application of protective coatings to the material. Pictures illustrate applications. A. M. Byers Co.

## PUMPS, COMPRESSORS

**319** **Circulating Pump**—Bulletin 1A-856 details seven advantages of company's Booster circulating pumps, and includes complete design and performance information. A capacity chart and specifications included. Bell & Gossett Co.

**320** **Wet Pit Pumps** — Sixteen-pp Catalog 3007 covers heavy-duty pumps for drainage, flood water, effluent boiler blow-off, hot wells, acids and alkalis. Illustrations, tables and text give design features of these wet pit pumps. Catalog also includes a condensed version of the Standards of Hydraulic Institute data section listing metals used in constructing pumps for handling various liquids. Also suggests factors to be considered in pump selection. Yeomans Brothers Co.

**321** **Condensed Pump Data** — Form 4383-J covers more than 20 types of general service pumps, rotary pumps, sump and drainage pumps, condensate units, self-priming units, stainless steel pumps and high-pressure pumps. In easy-to-find tabular form, each model is pictured along with its characteristics, applications and features. Goulds Pumps, Inc.

**322** **General Purpose Pumps**—Section B, 36 pp, describes rotary pumps for general purpose use. Explains positive displacement principle incorporated, gives suggestions for selecting proper materials of construction. Application and ordering information is provided on mounted and unmounted small pumps, large mounted pumps, pumps for operations requiring greater sealing, and large, totally enclosed models. An engineering section covers recommended speeds and capacities. Viking Pump Co.

**323** **Condensation Pumps**—Eight-pp Bulletin 1403 describes company's line of condensation pumps for use in low and medium pressure-heating systems and steam-process equipment. Photos, drawings and other technical data on capacities and dimensions pertaining to construction, application and installation are included. Dunham-Bush, Inc.

**324** **Close Coupled Pumps**—Revised Bulletin 242 describes design and operation advantages of company's close coupled pumps for industry, and includes large cutaway views illustrating component features. A composite rating table is included, as well as dimensions and other data. Warren Steam Pump Co., Inc.

**325** **Portable Compressors**—Twelve-pp Catalog GG-9A pictures 40 models of company's portable type compressors. A quick reference chart shows capacities, engine types, and mountings available. Illustrates such features as: replaceable cylinder sleeves, interchangeable valve parts, aircraft type compressor cylinders, heavy duty industrial type engines, and magneto ignition on all gasoline models. Le Roi Div., Westinghouse Air Brake Co.

## TOOLS, WELDING, AND MACHINE SHOP EQUIPMENT

**327** **Data for the Shop**—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44 pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. A section on metal working facts gives conversion tables, steel numbering systems, machinability ratings of metals, drill grinding charts, twist drill sizes and other data. Standard Oil Co. (Ind.)

**328** **Portable Electric Tools**—This standard catalog, Form 10, 24 pp, features portable electric tools, including electric drills, bench-

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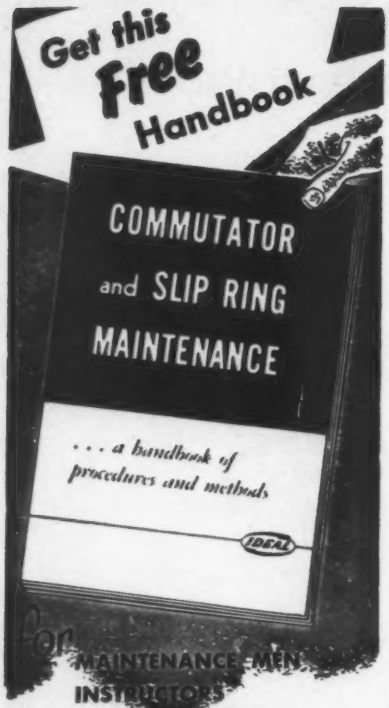


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# DATA FILE

(Begins on page 224)

drill stands, hole saws, buffing and polishing kits, sanders, polishers, grinders, hammers, saw blades, vacuum cleaners and others. Photos included. The Black & Decker Mfg. Co.

**329** Pipe Tool Ordering Guide — Catalog 2-51, 8 pp, covers company's line of threaders, cutters, vises, dies, tongs and wrenches; gives prices. Armstrong Bros. Tool Co.

**330** On Spot Welding—"Spot Welding from One Side—With a Portable Gun," 12 pp, describes an inert-gas-shielded tungsten-arc spot welding process. Over 30 tables, weld cross-section and application photos, drawings and graphs are included. Sections of text cover when to consider spot welding from one side, how the equipment operates, standards and test procedures, factors affecting weld. Air Reduction Sales Co., Div., Air Reduction Co., Inc.

**331** Industrial Tools—Hand tools and shop tools for production lines, maintenance work and service departments are featured in 108-pp Industrial Catalog 54-1. Loaded with pictures and tool facts, the book describes in detail the complete line of over 4,000 tools—including chests and cabs, wrenches and sockets, screwdrivers, pliers, pulling equipment, tool assortments and many others. Snap-On Tools Corp.

## CONSTRUCTION

**332** Glass for Industrial Use—How glass is used and how to choose the proper type for the application are covered in 12-pp Catalog 56-1. Discusses glass according to function; light diffusion and glare reduction; decoration; protection; and heat absorption. Photos showing various finishes and typical installations are provided, along with performance data, selection and installation tips, light transmission ratings and other data. General advantages offered by company's line of glass are also detailed. Mississippi Glass Co.

**333** Window Modernization—How to modernize old windows with company's glass blocks is told in 8-pp Bulletin GB-104. Selection data is included, along with photos of typical installations. Pittsburgh Corning Corp.

**334** Glass Blocks — This 24-pp catalog describes company's glass block and its functions, and lists various glass block patterns manufactured, including light and solar heat controlling blocks, with details on functional advantages of each specific pattern. Included are instructions and construction details for both large and small-size panel installations in steel, wood frame, brick or brick veneer construction. Table of dimensions; a section on how to calculate illumination and brightness; and tables on solar heat control and fuel savings included. Owens-Illinois Glass Co.

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**335** How to Glaze with Plexiglas—Sixteen-pp Booklet PL-23 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems. Gives properties and behavior of this sheet. Plastic Dept., Rohm & Haas Co.

**336** Panel Wall Construction—The advantages of company's M-Type Q-Panel walls are outlined in 12-pp Bulletin Q-35-55. Includes installation photos, diagrams, specifications, as well as drawings, pointing out structural details. H. H. Robertson Co.

**337** Non-Slip Flooring—Algrip, an abrasive rolled steel floor plate described as non-slip even on steep inclines, is the subject of Booklet AL-29, 8 pp. Discusses safety features; gives fabricating data. Alan Wood Steel Co.

**338** Air Tools, Paving Breakers—These two bulletins describe company's latest models of paving breakers and air tools for plant construction and maintenance work. Bulletin PB1 gives features and specifications on heavy-duty, medium-weight and lightweight paving breakers, as well as tools for use with them. Bulletin ST-100 describes and gives specifications for clay spaders, trench diggers and backfill tampers. Gardner-Denver Co.

## STORAGE EQUIPMENT

**340** Adjustable Shelving—How this shelving can save assembly time is explained in 28-pp Form 2111. Photos and drawings of various types of shelving units, including open and closed shelving, bin units, ledge shelving, counter shelving, cabinets with swinging and sliding doors, parts and accessories are included. Standard Pressed Steel Co.

**341** Storage Shelving — Rapid erection, strength and other advantages of manufacturer's storage shelving are stressed in this illustrated bulletin. Shows component parts, open types, closed types and some of the many combinations of dividers, bins, doors available. Also presents tool inserts, other shop equipment. DeLuxe Metal Furniture Co.

**342** Steel Lockers—Catalog L-100A, 20 pp, features a complete line of steel lockers designed for safer storage, longer life and better housekeeping. Contains descriptions, illustrations and specifications for various types of units and storage combinations to suit a variety of different installations. Penco Metal Products Div., Alan Wood Steel Co.

**343** Storage Equipment — Catalog 100-E, 72 pp, illustrates and describes company's complete line of steel cabinets, folding chairs, chests and safes, stools, tool boxes, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, revolving bins, others. Includes dimensions and other specifications. Photos illustrate some typical equipment installations. Lyon Metal Products, Inc.

## MAINTENANCE

**344** Basic-Roofing Information—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job. Johns-Manville.

**345** Hot-Dip Galvanizing—How hot-dip galvanizing is prolonging life of industrial equipment is stressed in this 16-pp booklet. Photos, showing galvanized equipment in use accompany brief text explaining how this process of covering iron and steel with a protective coating of zinc serves to prevent rust. The galvanizing procedure is explained and illustrated. Coating comparison charts show how hot-dip galvanizing compares with other types of coatings as to rust resistance, dimension limits, shock resistance. American Hot-Dip Galvanizers Assn., Inc.

**346** On Rust Prevention — This 1956 General Catalog, 38-pp Form 255, presents a treatise on rust prevention with illustrations of Rust-Oleum uses and applications throughout industry. Included are 102 color chips showing variety of colors available in primers, short oil type coatings, oil field finishes, restful color group finishes, machinery and implement colors, long oil type coatings, calvinoleum coatings, heat resistant coatings, chemical resistant coatings. Rust-Oleum Corp.

**347** Protective Paint—Thirty-five case histories of successful use of protective coatings based on chlorinated rubber are included in this 20-pp bulletin, "Protection With Parlon." Photos show water and sewage works, paper mills, storage tanks, and chemical and food processing plants where these coatings have had long-term exposure to corrosive environments. Includes performance data, instructions for application. Hercules Powder Co.

**348** Painting with Aluminum—This helpful booklet discusses advantages of aluminum paints, describes three basic types for non-absorbent surfaces, for weather-exposed wood, and for heated surfaces and those not exposed to weather. Typical maintenance applications are covered in text and picture, and practical suggestions for good results included. Use of

# Tuffy® Sling Bulletin

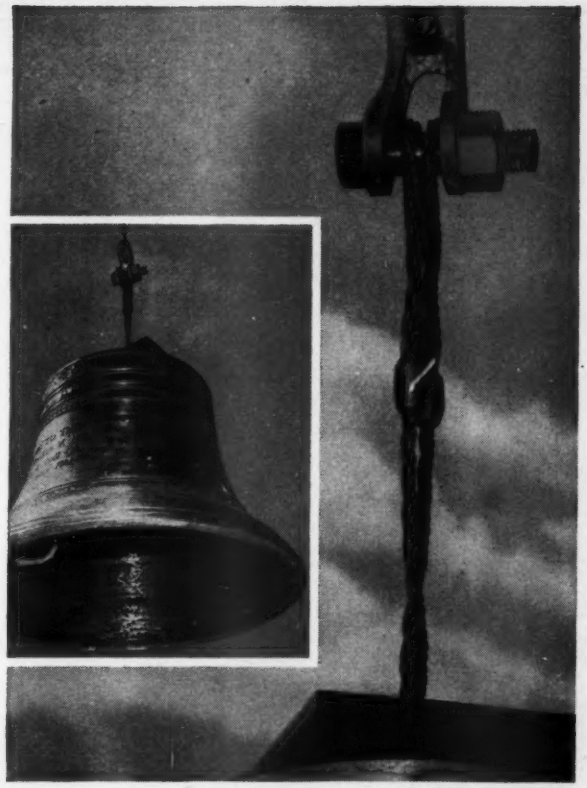
Reporting the Outstanding Performance of Union Wire Rope's Machine-Braided Wire Fabric Slings.

## 3,200-Lb. Bell Rides High on 1½-Lb. Tuffy Sling

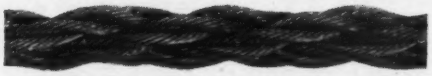
Tuffy takes unusual jobs in stride. The bells are safely in place atop the 180-ft. carillon tower of the new St. Luke's Methodist Church in Oklahoma City, and a Tuffy Sling played an important part in getting them there.

The contractor (who used Union Wire Rope 100% on this building) asked Union Wire Rope Corporation to come up with a sling strong enough to lift the 42 bells (one at a time) into place in the tower. The bells ranged from a little fellow of 22 pounds to a giant of 3200 pounds. What's more, an eye of the sling would have to be put through a 1-inch hanger at the top of the smallest bell.

Ticklish assignment? You bet. Those bells were made to special order in Holland. But we had the answer in one of our ⅜-inch U-1 Tuffys. The job of raising $31,000 worth of bells, entrusted to a $7.40 Tuffy Sling, was safely accomplished.



## Machine-Braided Wire Fabric Popular Successor to Wire Rope in Sling Construction

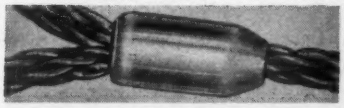


The unique machine-braided construction of Tuffy slings provides a combination of super flexibility and extra toughness never possible with ordinary wire rope. The difference is in the patented 9-part fabric, braided by machine in a process that eliminates inequalities of hand-braiding. Result: a fabric which can be bent easily and repeatedly around small radii or abrupt corners.

### So Flexible Kinks Pound Out Without Sling Damage

Tie a knot in a Tuffy sling. Pull it as tight as you can with your hands and feet. Then untie it. See how easily the braided fabric straightens out again. You kink it with the aid of a vise, but it's still easy to straighten the fabric without material damage. If one of the nine parts is cut or broken under severe punishment or abuse, it does not result in stranding. No need to tell you this flexibility eases and speeds the hitching and unhitching of loads.

### Tuck-Splicing & Pressed-On Ferrule Make Eyes "Tuffy Tough"



The development of Tuffy machine-braided fabric, with its big user-economies of greater strength, faster handling and longer service life—was followed by the introduction of the revolutionary Tuffy ferrule.

This ferrule, slipped over the tuck-splice of the eye and pressed on under great pressure, holds so tight that it gives the eye of the sling 100 per cent of the strength of the fabric. Result: greater safety, speedier handling, more sling-eye strength—at no increase in cost!

### *Mail Coupon for Free Tuffy Sling Handbook*

60 pages packed with information about new, factory-fitted Tuffy slings with pressed-on super-strength ferrule. Plus facts on nearly a dozen new and standard fittings, and complete data and charts on all Tuffy slings. And a brand-new engineer's notebook and riggers manual. Send for your copy now.

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# DATA FILE

(Begins on page 224)

aluminum paint on steel, galvanized metal, wood, masonry is detailed. Aluminum Company of America.

**349** **Paint Work Book**—Bulletin 760, about 12 pp, is a practical manual giving painting data in charts, tables, diagrams and illustrations. Factors relating to use of company's protective coatings in mild to severe corrosive service are covered. Coatings and related primers are presented, along with surface preparation, priming, application methods and maintenance instructions. Care and cleaning of brushes and spray equipment is explained. A table gives chemical resistance rating of each coating to over 200 corrosive agents. Limitations of each coating are also given and cost factors cited. The U. S. Stoneware Co.

**350** **Insulation Coating** — This 32-pp illustrated handbook, Form L-17, presents the advantages of company's NoDrip insulation coating for preventing condensation drip from metal, concrete, brick, wood, plaster or composition surfaces. Lists applications and describes methods of applying. Contains tabulated data on quantity required to cover various size tanks and pipe. J. W. Mortell Co.

**351** **Building Maintenance** — Handbook 7 offers 64 pp of information on floor surfacing, leak stoppers, external wall sealants, roadpatching, roofing materials. Includes instructions for applying them. Flexrock Co.

**352** **Better Floor Care** — This illustrated folder describes products designed to aid efficient floor care. Lists combination Scrubber-Vac machines, conventional scrubbing-polishing machines, steel-wool pads, applicators, vacuum cleaners, mop trucks and other mopping equipment. Included are waxes, sealers and cleansers. Finnell Systems, Inc.

**353** **Industrial Vacuum Cleaning** — Twelve-pp Bulletin 155 B describes both stationary vacuum cleaning equipment and portable industrial vacuum cleaners, the latter in both light- and heavy-duty types. Recent improvements in collection and dumping methods are covered, and photos show application to conveying, reclaiming, bench work and removal of water. Specifications and ratings are included. Spencer Turbine Co.

**354** **Stationary Vacuum Cleaning**—Twelve-pp Bulletin A-939 describes a stationary vacuum cleaning system for industrial application. Lists advantages and describes and illustrates component parts, along with coordinated accessories and auxiliary equipment. U. S. Hoffman Machinery Corp.

**355** **Light Scaffolds** — This series of illustrated bulletins describes company's line of aluminum alloy Up-right scaffolds and accessories. Pictures one-piece sections and multi-section models with various ranges of adjustability. Points out such features as locking hooks which provide automatic security and locking casters for safety on stairways and inclines. Up-Right Scaffolds Div., Up-Right, Inc.

## INSULATION

**356** **Piping Insulation** — Seven-pp Bulletin SO 1054 features a snap-on, one-piece molded pipe insulation of fine glass fibers for hot or cold piping. Specifications are given for industrial, commercial, and institutional piping where maximum efficiency is of primary importance and for hot water and low pressure steam. Gustin-Bacon Mfg. Co.

**357** **Pipe Insulation**—Bulletin F 1-100 features on-the-job installation photographs of cellular glass insulation for pipe temperatures between—300 and 800 F. Complete listing of physical properties, condensed specifications are given. Pittsburgh Corning Corp.

## SLING CHAINS, WIRE ROPE

**358** **Industrial Wire Rope** — Bulletin DH-128D, 24 pp, features wire rope recommendations for industrial services. Covers more than 120 types of wire ropes used in construction, conveyors, cranes, dredges, steel mill and blast


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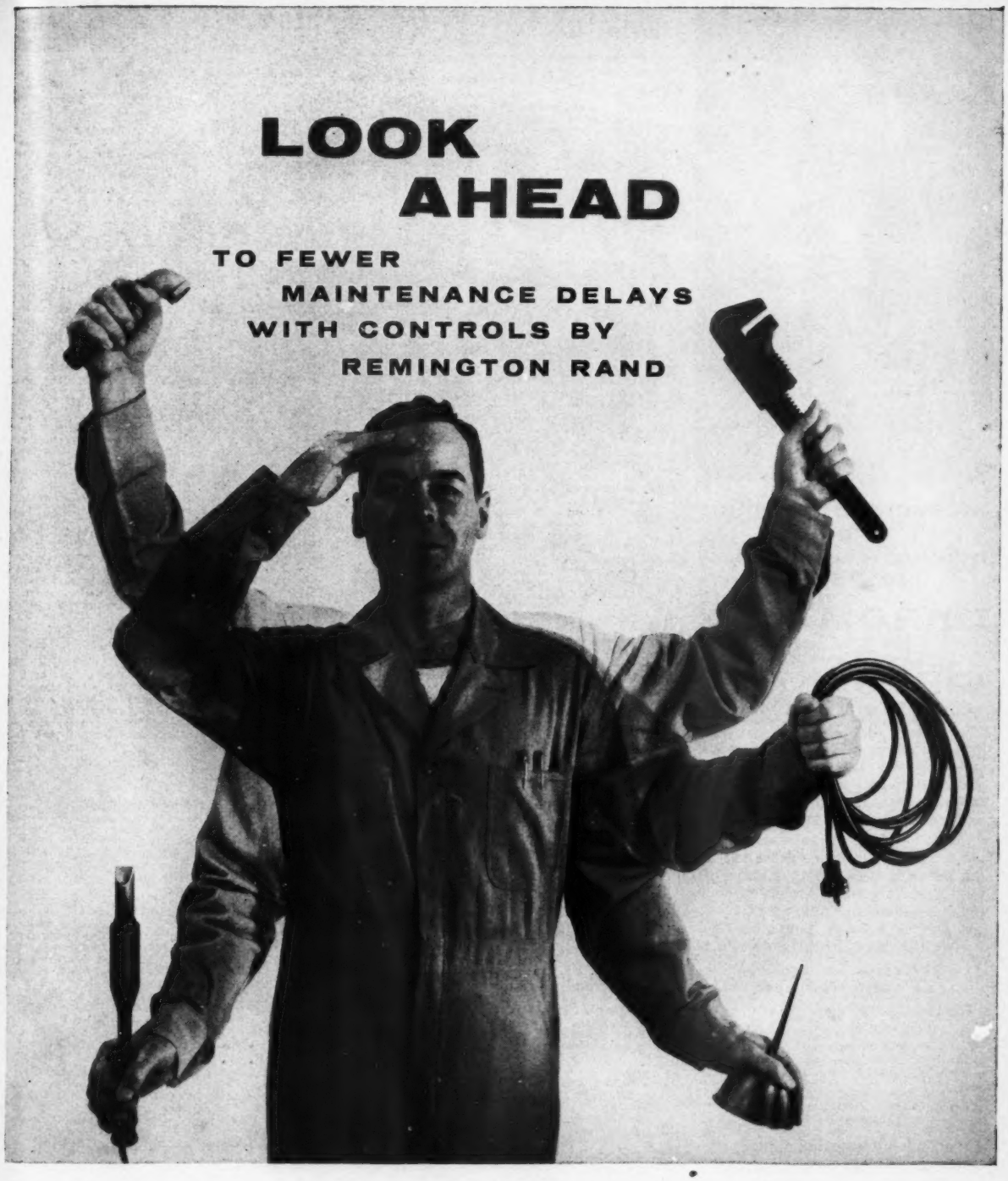


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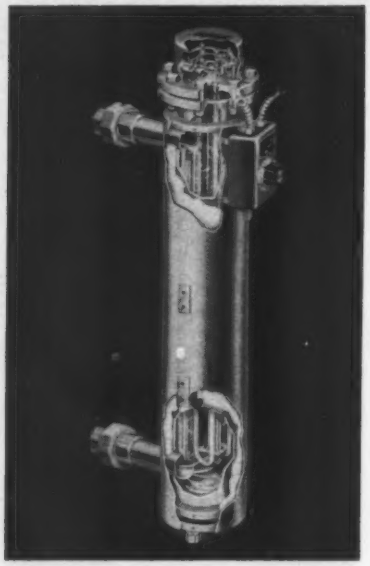

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# DATA FILE

(Begins on page 224)

furnaces, coal bridges, guy ropes, inclines, platform lift trucks and winch lines. Each recommendation covers such points as rope diameters, construction, preforming, lay, grade and core. In addition, charts covering weights and breaking strengths are provided. American Cable Div., American Chain & Cable Co., Inc.

**359** **Sling Chain Handbook**—Illustrated Data Book 100, 32 pp, presents "how to do it" information on sling chains—from ordering to care, use and inspection. Contains diagrams, charts and tables on standard and special styles of sling chains and attachments, and their sizes, weights and working load limits under many conditions. Columbus McKinnon Chain Corp.

**360** **Splicing Wire Rope**—Instructions covering the methods used in making various types of wire rope splices are fully detailed in this 16-pp bulletin. Each step in the operation is described and illustrated with easy-to-follow drawings. Additional data is given in the form of tables. Macwhyte Co.

**361** **Sling Handbook**—The 64-pp new edition of the Tuffy Sling Handbook is replete with illustrations, charts and diagrams describing 16 factory fitted slings and nearly two dozen standard fittings available for slings, including several which are recent additions to the line. Book contains a complete rigger's manual, shop chart of ratings, an engineer's notebook and standard signals for directing operations of overhead traveling cranes and derricks and locomotives. A new development featured is the steel ferrule splice now on all Tuffy slings, which affords safety and other advantages. Union Wire Rope Corp.

## MATERIALS HANDLING

**362** **Electric Hoists**—Twelve-pp Bulletin DH 133B describes Speedway electric hoists of 500- to 4000-lb capacities. Fully illustrates and explains design features and gives details on suspensions and conducting systems. Clearance data, specifications included. Wright Hoist Div., American Chain & Cable Co., Inc.

**363** **Overhead Cranes**—Bulletin T202, 20 pp, gives full information on top running double girder cranes with top running trolley in capacities from 2 to 12 tons, spans to 60 ft. Data is also given on top running single girder cranes, both motor driven bridge types and head geared or push type in capacities from 1 to 10 tons, spans to 50 ft. Features which contribute to efficient operation and low maintenance costs are detailed. Electrical information included. Chicago Tramrail Corp.

**364** **For Overhead Handling**—Booklet 2008-M, 12 pp, is replete with illustrative material on principal components of overhead handling systems. Track design and advantages of supporting it flexibly are described, and formulas and figures for comparing various track sections are included. Among subjects covered are various carriers for hand, electric and automatic operation; tractors; track switches; standard cranes, transfer cranes and gantry cranes; safety electrification; buckets and grabs. Cleveland-Tramrail Div., The Cleveland Crane & Engineering Co.

**365** **How to Choose a Crane**—Designed to aid in the selection of overhead cranes, 8 pp Unit 79 shows how to analyze handling problems, decide on the type of crane desired and draw up specifications for crane proposals. Basic data is provided on classes of crane service, crane ratings and capacities and recommended speeds for bridge, trolley and hoist, along with standard dimensions and clearances. Gives 14 safety features. Whiting Corp.

**366** **Crane and Hoist Parts**—Bulletin G8 covers company's line of hoist grabs as well as component parts for various type cranes. Includes photos and drawings of the parts, along with descriptions and specifications. Downs Crane & Hoist Co.

**367** **Electric Hoists**—This illustrated brochure describes company's line of electric hoists designed for big-lift applications. A large cut-away view showing component features is included, as well as photos of typical applications. R. G. LeTourneau, Inc.

**368** **Steel Conveyor Belts**—"A profitable approach to the selection of steel processing conveyor belts" is the subject of this 16-pp bulletin. Simplified selection, standard specifications, and installation information are included. Photos and diagrams illustrate the text. The Colorado Fuel and Iron Corp.

**369** **Engineered Conveyor Systems**—Catalog 835, 32 pp, illustrates conveyor systems in use in a wide range of industries, showing how they suit handling requirements involved. Roller, wheel, belt, chain, overhead trolley and elevating conveyors are included, also spirals, portable power conveyors, ball transfers and special equipment. Mathews Conveyer Co.

**370** **Lift Truck Work Kit**—A method of predetermining the time necessary for fork lift trucks to perform specific operations is provided in this work kit, designed to enable plant engineers to apply fork lift truck standard performance data. It can assist in determining efficiency of fork lift trucks now in use as well as in planning for future needs. Includes typical materials handling examples to show technique for application of the data, as well as charts providing times for basic truck motion elements. The Yale & Towne Mfg. Co.

**371** **Load Handling Equipment**—Bulletin 406, 24 pp, covers company's Budgit, Tugit and Load Lifter products and other load handling specialties. Catalog numbers, sizes and specifications are tabulated, and application photos of the various products are included. Complete specifications and principal dimensions are indicated on tables. Manning, Maxwell & Moore, Inc.

**372** **Electric Freight Elevator**—Bulletin A-414, 12 pp, contains design and operation information on company's plunger electric freight elevator designed for low-rise, light and heavy duty freight handling requirements. A sectional diagram points out component parts, and an installation diagram and size and capacity table are included. Otis Elevator Co.

**373** **Oil-Hydraulic Lifts**—Catalog RE-203, 20 pp, covers the field of heavy-duty oil-hydraulic lifting devices for industrial applications. Featured in catalog are company's standard Levelator lifts, a 6000 lb single-jack model and a 12,000 lb dual-jack lift. Also featured is an electric pump mounted on an oil tank for powering oil-hydraulic devices. Illustrates lift platforms, platform accessories and safety devices, jacks, power units. Rotary Lift Co.

**374** **Casters and Wheels**—Catalog 138 is a 191-pp product manual on company's line of casters and wheels, describing design features and listing full specifications. Photos and drawings are used profusely to illustrate data, covering furniture casters, wheels, glides, desk shoes and various accessories. Darnell Corp.

**375** **Shock Absorbing Casters**—Twenty-pp Catalog FH-53 describes construction features of company's Floating-Hub casters, listing types and mountings now available. Load ratings for each type and size are provided. Stresses, by text and illustration, how these shock absorbing casters work, permit smooth travel over rough floors. The Bassick Co.

## WATER TREATING

**376** **Industrial Filters**—How industrial filters can lower production costs is the theme of 10-pp Bulletin 651. Several simple case histories—from filtering city water to the filtering of recirculation water from cooling towers and spray ponds—are cited. Company's new line of IWF filters is featured, including sectional views, typical installation drawings, dimension charts. R. P. Adams Co., Inc.

**377** **Feedwater Treatment**—Process Bulletin B1, "Treatment of Boiler Feedwater by the Direct, or Internal Method," discusses advantages of direct treatment, as a complete treating program or as a supplement to external systems. Explains why direct treatment is convenient, economical, and complete, and points out how it improves steam quality and reduces boiler maintenance costs and down-time. National Aluminate Corp.

**378** **Mixed-Bed De-Ionization**—Practical equipment for mixed-bed de-ionization at flow rates of 5 gal per hr to 5000 gpm is described in this 8-pp illustrated bulletin. Advantages of the mixed-bed de-ionizer are detailed, and installation and mechanical construction features discussed. Illinois Water Treatment Co.

# Now available to industry for the first time:

## a 2-speed hoist built to P&H quality standards

### the P&H 2-speed HEVI-LIFT

(capacities 1,000 to 10,000 lbs.)

Here is a 2-speed hoist with unmatched quality — built to the same exacting standards that have made the P&H Hevi-Lift the accepted leader in the field of heavy-duty electric hoists. Faster hoisting speed with accurate slow-speed spotting that gives better control, is only one of its outstanding features.

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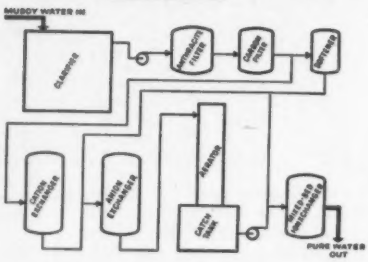


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# DATA FILE

(Begins on page 224)

## BOILERS, GENERATORS

**379** **Steel Boilers**—Revised General Catalog 80, 32 pp, is a condensed but complete product guide on company's high and low pressure steel boilers. Also included are full descriptions and illustrations of water heating products, both direct fired and storage types as well as indirect water heating coils. Pages on boiler support brackets, structural steel suspension and induced draft fans, as well as pictures of installations are included. Kewanee-Ross Corp.

**380** **Packaged Boilers**—This 16-pp illustrated catalog describes manufacturer's new Type VP Package boiler. Following a section of background information, is an outline of principal design features of these boilers, which are shop assembled and provide steam capacities from 4000 to 40,000 lb per hour. Space requirements are shown in a table along with specifications. Combustion Engineering, Inc.

**381** **Self-Contained Boilers** — Bulletin AD-144 reviews company's new CB boilers. Illustrations include installations, demonstrations. Engineering articles are featured covering such subjects as low noise level. Cleaver-Brooks Co.

**382** **Shop Assembled Boiler**— Sixteen-pp Bulletin G-76 completely describes and illustrates company's Type FM water-tube integral-furnace boiler, made in standard sizes from 2900 to 28,000 lb of steam per hr, pressure to 250 psi. The Babcock & Wilcox Co.

**383** **Standard Generators**—Bulletin B-55-4 describes company's SC economy series of standard steam generators designed to reduce steam costs for industrial plants. Pre-engineered, standardized steam generators offered in nine sizes with capacities of from 50,000 to 150,000 lb per hour are described, and schematic and cutaway drawings of the units and design features are included. Foster, Wheeler Corp.

**384** **High Temp Water Generators**—High temperature water generators are described in 10-pp Bulletin 700. Advantages of operation and design are detailed, typical erection time is illustrated, and a table showing anticipated savings for high temperature water units compared with high pressure steam is included. The International Boiler Works Co.

## SPACE, PROCESS HEATING

**385** **Plumbing, Heating Supplies—Edition H** is the current edition of this company's 126-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and generously illustrated; gives sizes, intended uses. J. A. Sexauer Mfg. Co., Inc.

**386** **Unit Heaters**—Catalog 155, 32 pp, presents unit heaters for steam and hot water in vertical and horizontal delivery and power-throw types. Covers design features and provides performance and capacity data. Also provides information on unit heater selection, sound ratings, locating unit heaters, motor wiring and control. Piping and installation suggestions are included as well as typical unit heater specifications. Modine Mfg. Co.

**387** **On Unit Heaters**—Latest improvements, specifications and performance data for Herman Nelson horizontal and vertical unit heaters are covered in 36-pp Bulletin 700A. Includes complete hot water and steam performance tables, dimensions, selections, applications, descriptions of cabinets, elements, motor mountings, fans and accessories, controls. Also provided are suggested layouts, piping diagrams, other data. American Air Filter Co., Inc.

**388** **Revolving Unit Heaters**—Bulletin HR-6A, 16 pp, features revolving unit heaters for industrial plant heating, presenting design and construction details and showing typical installations. Engineering data, mounting heights and coverage, and dimensions are tabulated, and dimension drawings are included, along with installation planning tips and specifications. L. J. Wing Mfg. Co.

**389** **Industrial Ovens**—Engineering, manufacturing and installation of processing ovens are described in Bulletin D-53-20, 16 pp. Covers oven types, application to industry source of heat, selection of heater, control of heat, distribution of heat. Photos show typical oven installations, and a complete modern finishing process is presented. Newcomb-Detroit Co.

**390** **Electric Heating Units**—Catalog 50, 50 pp, contains complete engineering data on electrical heating units and equipment, including strip elements, finstrip elements, tabular elements, cartridge elements, ring elements, immersion heaters, circulation heaters, radiant heaters, forced air duct heaters, unit heaters, hot plates and others. Includes photos, dimensional drawings, price and standard rating tables and other specifications. Edwin L. Wiegand Co.

## MECHANICAL POWER TRANSMISSION

**391** **Roller Chains, Sprockets**—Catalog 754, 64 pp, describes, illustrates a line of roller chain stock sprockets, including minimum bore sprockets for reboring, also finished bore and Taper-lock bushed sprockets which are ready to use. Tables show speed ratios for sprocket combinations, standard keyways and setscrews. Includes chain selection and application data, installation and lubrication recommendations, chain length calculations, dimensions and price lists for single and multiple strand roller chains. Diamond Chain Co.

**392** **Sprockets and Chain**—Bulletin A-624 24 pp, is compiled to provide plant engineers with all data required for selecting and ordering roller chain and sprockets. Devotes a page to Taper-Lock sprockets for each size of chain from 40 to 100, giving sectional drawing, dimensions, number of teeth, maximum stock bore available, weights, prices and other data. Another page covers Taper Lock bushings; and full information is given on riveted and cotter-type roller chains. Dodge Mfg. Corp.

**393** **Power Drives**—Book 2447, 28 pp, features company's line of gearmotors and Motogears, and includes selection data together with features of construction, load classifications, dimension tables, overhung load ratings and mounting assemblies. Design features are illustrated through photos and cross-sectional views and dimension drawings included. Link Belt Co.

Reader Service Cards for ordering catalogs are on pages 219-220. Be sure to include your name, job title, and company.

**394** **Fluid Drive**—Eight-pp Bulletin 9819 describes and illustrates adjustable speed Gyrol fluid drives, 1- through 25-hp, giving advantages and applications. Components and operation are covered in detail and selection tables are provided for direct connected and V-belt types. American Blower Corp.

**395** **Adjustable V-Belt**— This 8-pp catalog covers company's Veelos TD and TE V-belt designed to reduce installation and operation costs on big drives. Studs, cup-washers and T-screws of the belt are illustrated, and installation and operation characteristics explained. Booklet includes directions on how to measure, to couple and uncouple, and to install the belts. Manheim Mfg. & Belting Co.

**396** **Flexible Couplings**—Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings for power transmission. Tells advantages of these couplings and discusses design principles. Double-flexing and floating shaft types, light duty couplings and types for special applications are described and pictured in detail. Thomas Flexible Coupling Co.

## ELECTRICAL

**397** **Motor Buying Tips**—Bulletins GEC-1026A and GEC 1027A, each 11 pp, gives buying information on a selected group of this manufacturer's motors. Included are application data, ratings and prices for fractional horsepower motors, integral-horsepower polyphase and single phase induction motors, motors and control for part winding starting, gearmotors and resilient-base integral-horsepower induction motors. General Electric Co.

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Delta's great new 20" Drill Press was designed, engineered and built to fill industry's growing need for *flexible* production tooling. Here is why it can save you money by handling jobs normally requiring machines *costing four and five times as much:*

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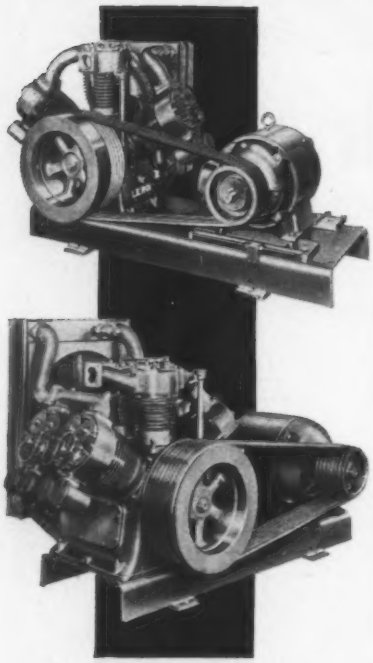

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# DATA FILE

(Begins on page 224)

**398** **FHP Manual Starters**—Bulletin 224 is a folder giving the features and ratings of a line of fractional horsepower manual starters. Lists applications for them. Square D Co.

**399** **Motor Controls**—In the 86-pp Controlog are cataloged a variety of motor controls including starters, control centers, contactors, relays, switches, and accessories. Fully illustrated with photos and dimensional drawings, gives applications and descriptive information on each class, and includes prices and ordering data. General engineering data for estimating purposes included. The Clark Controller Co.

**400** **What You Should Know About Circuit Breakers**—Sixteen-pp Manual 101 explains operating principles of basic circuit breaker designs and provides engineering data on factors of application. Includes simplified diagrams of three basic types. Illustrates with colored charts and diagrams, explains temperature factors, inrush current effects, tripping and reset time. Heinemann Electric Co.

**401** **Enclosed Switches**—Catalog 83, 28 pp, describes in detail enclosed switches for industrial applications. Included are general switches designed for use on either a-c or d-c purpose switches, sealed switches, heavy-duty limit switches, hand operated switches, and maintained-contact switches, all of which are available in a variety of actuator designs, contact arrangements and electrical ratings. Photos, dimensional drawings, circuit diagrams, electrical data are included. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

**402** **Low Voltage Switchgear**—Twelve-pp Bulletin 6004B presents low voltage switchgear of the metal-enclosed, drawout type for indoor and outdoor installation using Types K and LG air circuit breakers. Design and construction details are explained and illustrated and emphasis is placed on safety advantages afforded by test position with door closed. General specifications and standard frame arrangements given. I-T-E Circuit Breaker Co.

**403** **Commutator Slip Ring Maintenance**—This practical little 40-pp handbook gives procedures and methods for commutator and slip ring maintenance. Generously illustrated with photos and sketches, booklet contains sections devoted to common troubles and their corrections; brushes; general maintenance; and company's products for maintenance of commutators and slip rings. Defines commutator terminology. Ideal Industries, Inc.

**404** **High-Capacity Fuses**—Form HCS, 6 pp, describes fuses of unlimited interrupting capacity on voltages to 600, designed to afford protection for loads of 600 to 5000 amp. Includes test data, charts on opening time, current limiting effect. Bussman Mfg. Co.

**405** **Panel Components**—Bulletin EE-120 is a 54-pp panel builders handbook of electrical components, containing specifications, diagrams, dimensions, photos and price lists of company's motor control. Profusely illustrated with photos, dimensional and wiring diagrams, bulletin covers manual starters, relays and contactors, magnetic starters in non-reversing, reversing, and multi-speed types, and a group of accessories which include thermal overload relays, oil tight pushbutton units, limit switches, timing devices, solenoids, electrical interlocks, and solenoid-operated brakes. Cutler-Hammer, Inc.

**406** **Aluminum Conduit Fittings**—To fulfill the need for electrical equipment made of materials which resist corrosive attack of many chemicals destructive to ferrous or standard aluminum equipment, Bulletin 2681 presents a broad selection of Condulets and related equipment utilizing copper-free aluminum alloy in their construction. It includes Condulets, lighting fixtures, plugs and receptacles and others for both hazardous and non-hazardous locations. Book provides a pictorial-descriptive index plus full catalog listings, prices. Crouse-Hinds Co.

**407** **Switch Wiring Diagrams**—Bulletin 709 is a 36-pp booklet of typical wiring diagrams for across-the-line starting switches. Indexed and arranged for easy use, this booklet serves as a guide to some of the many ways in which this company's manual and magnetic across-the-line starters can be applied. Some


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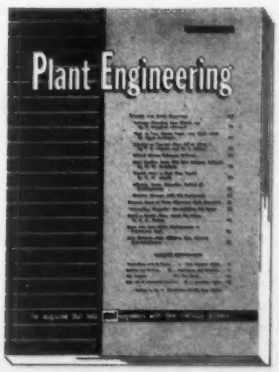

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# DATA FILE

(Begins on page 224)

of the diagrams incorporate more than one useful feature. Includes key to electrical symbols used. Allen-Bradley Co.

**408** **Trolley Busway Systems**—Three bulletins offer real help on electrical installations involving cranes and hoists, assembly and production lines, moving test lines and other moving electrical equipment. Bulletin 35 (28 pp) covers 225-500 amp systems; Bulletin 50 (44 pp) 100 amp systems; Bulletin 45 (40 pp) 60 amp systems. Each includes special sections on installation planning and procedure, methods of mounting and descriptions and illustrations of equipment. Feedrail Corp.

**409** **Asbestos Insulation**—"Specifications for Asbestos Varnished Cambric N.E.C. Type AVA Lighting Wire and Power Cables," 8 pp, establishes performance tests for asbestos insulation applied as a felted wall in combination with varnished cambric tapes for wires and cables with 600 and 1000 v ratings. Also measures plus values of the construction over and above industry standards. Standards for test characteristics, such as minimum permissible breakdown after initial dielectric test are covered. Rockbestos Products Corp.

**410** **Testing Instruments** — Bulletin 19-56, 16 pp, features company's electrical testing instruments, including ohmmeters, ground testers, dielectric test sets, motor rotation tester, cable fault locating equipment, transformer turn ratio test sets, corona test equipment, frequency meters, tachometers, others. Includes photos and descriptions of each type, including chief features, operating ranges, and suggested applications for them. James G. Biddle Co.

**411** **Battery Manual**—Battery selection techniques are emphasized in 20-pp Bulletin 210, a revised edition of this manufacturer's manual on storage batteries for stand-by power, emergency lighting and switchgear applications. A discussion of charging equipment and simplified battery maintenance procedures is included. Storage battery installation procedures are described and illustrated by photos. Exide Industrial Div., The Electric Storage Battery Co.

**412** **Handbook on Storage Batteries**—This 64-pp booklet of instructions and technical data is the sixth edition of this company's battery service manual. Provides a brief treatise on the theory of the lead-acid battery. Gives detailed instruction on the care and operation of batteries, on maintenance and repairs, and on standard and special parts. Booklet is of special value to plant engineers concerned with storage batteries for cycle service in industrial trucks and materials handling equipment. Gould-National Batteries, Inc.

**413** **Motive Power Batteries**—This 48-pp general service manual on lead acid batteries for all types of motive power application is a practical guide to industrial cycle service, including industrial truck, air conditioning, and others. Includes photos, charts, tables, methods of repair, maintenance and theory of operation, instructions covering repairs with regular or special tools, simplified testing methods, including safety practices, acid handling precautions, and charging methods. C. & D. Batteries, Inc.

**414** **Flexible Cords** — This well-illustrated 24-pp booklet includes all new Underwriters classifications for flexible cords manufactured by this company. Featuring data on Dynaprene and rubber jacketed cords as well as braid covered types, also gives tips on how to select proper cord. Whitney Blake Co.

**415** **Cable Troughs**—This 12-pp catalog offers a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings, horizontal elbows, inside and outside vertical elbows, ties, crosses, covers, and many special fastening devices to save time and labor. Contains full instructions for installation, load charts, accessory items, some typical installations and full list of distributors. The Globe Co.

## LIGHTING, SIGNALING

**416** **Architectural Floodlighting** — Eight-pp Bulletin GEA-6437 illustrates various methods of floodlighting industrial plants, public and commercial buildings and others. Provides in-


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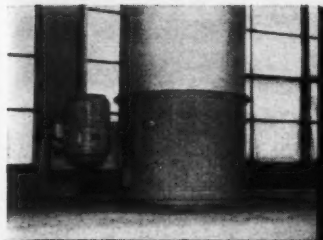

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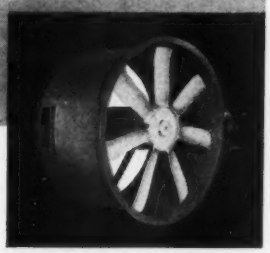

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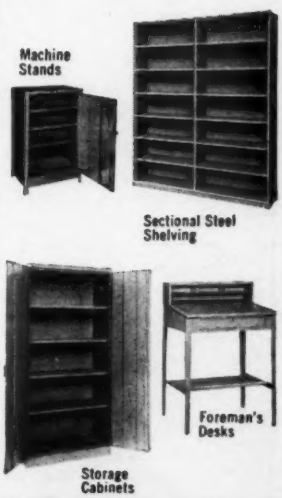


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# DATA FILE

(Begins on page 224)

formation on general purpose heavy-duty floodlights. Also contains tips on floodlighting of vertical surfaces and discusses four "musts" of an efficient economical floodlighting installation. A table of recommended foot-candle levels for exteriors provided. General Electric Co.

**417** **Fluorescent Lighting**—This 24-pp fluorescent lighting guide book is a reference digest on fluorescent products. Gives advantages of this type of lighting; summarizes various lamps and parts, including starter sockets, lampholders. Includes reference chart for lamp performance when interchanged with typical ballasts. Sylvania Electric Products Inc.

**418** **Guides to Luminaires** — Pocket-size, 28-pp Bulletin B-5799-BB covers fluorescent luminaires for industrial and other use. Summarizes salient features of each type of luminaire as it discusses electrical characteristics, maintenance and mounting data, details of construction, dimensions, and recommendations for application. Also contains a pictorial guide to floodlights and incandescent luminaires for industrial and other use. A 4-pp tabulation of buying data is provided. Westinghouse Electric Corp.

**419** **Industrial Lighting Units**—The 36-pp 1956 Edition of the RLM Standard Specifications for industrial lighting units contains important revisions in specifications on both incandescent and fluorescent industrial lighting units, as well as new lighting data of special value to specifiers. Most important of the changes and additions are new coefficient of utilization tables for eight incandescent and fluorescent lighting units. Calculations are based on latest Zonal Method of computing coefficients of utilization and illumination on room surfaces. Also included are revised light distribution curves on RLM fluorescent lighting units. RLM Standards Institute, Inc.

**420** **Industrial Lighting**—Designed to be inserted in company's lighting catalog, these two data sheets describe application, construction, installation and wiring details of two types of lighting units. Section 30, Sheet 20 features all-porcelain industrial units and Section 30 Sheet 18 covers vapor-tight units. Engineering data included. Day-Brite Lighting, Inc.

**421** **How to Use Sound Signals**—This 44-pp combination manual, data book and catalog is an excellent reference work on industrial sound signals. Includes a simplified explanation of fundamentals of sound; a glossary of sound and signal terminology; a quick-comparison guide for selecting equipment; suggested steps in choosing a signal installation, and hints for compiling a code signal call system. Benjamin Electric Mfg. Co.

**422** **Signal Equipment**—Tips on how to select suitable signals for any specific operation are offered in one of a series of bulletins—Nos. 100-125—bound in this 40-pp catalog. Other bulletins describe horns, bells, warning lights, other signal equipment. Specifications, photos, wiring diagrams, dimensions, audibility rating charts, electrical characteristics and other data included. Federal Sign & Signal Corp.

## DUST CONTROL

**423** **Dust Control**—"Engineered Efficiency in Dust Collection and Recovery," 36 pp, discusses industrial dust recovery from standpoint of nuisance abatement, waste avoidance, hazard elimination. Shows effect of variation in particle size, distribution and specific gravity of dust on efficiency of the dust collecting system. Buell Engineering Co., Inc.

You'll save time in ordering catalogs by using the Reader Service Cards on page 220. Of course we honor letterhead requests—but it takes us somewhat longer to handle them.

**424** **Dry-Type Filters**—Bulletin 600, 8 pp, describes company's Staynew ventilation and air conditioning filters. Specifications, engineering, performance and installation data covering dry type panel filters for the removal of air-borne impurities given. Dollinger Corp.

**425** **Dust Filter**—Design, application and benefits of company's AC dust filter are described in illustrated 26-pp Bulletin 559. Filter performance curves, principle of air filtration, filter comparison charts, woven vs felted filtering media are featured, along with technical data on design, capacity ratings, dimensions, velocity, air volume and pipe friction tables. Installation photos included. The Day Co.

**426** **Flexible Hose**—A set of five bulletins (Nos. 40 through 44) are of interest to plant engineers concerned with the design, installation or purchase of flexible hose for dust and fume control, air conditioning and materials handling. They provide general information, data on installation, application suggestions, technical data and prices on hose, duct and accessories. The Flexaust Co.

**427** **Dust Control Systems**—Valuable engineering data on methods of dust control as well as descriptions of company's line of dust collectors are contained in illustrated Bulletin 636-2. Specifications on all models are included. A special section tells how to design your own system. Aget Mfg. Co.

**428** **Dust Collectors**—Operation, construction, versatility and maintenance of company's unit dust collectors are explained in this bulletin. Includes capacities, sizes. The Kirk & Blum Mfg. Co.

**429** **Hydro-Filter** — Bulletin 556 describes outstanding features of company's hydro-filter for industrial dust collection. Cutaway view shows construction and design details, and diagrams showing dimensions and a table of capacities included. National Dust Collector Corp.

**430** **Flexible Tubing**—Spiratube A and R—flexible, lightweight, reinforced fabric duct


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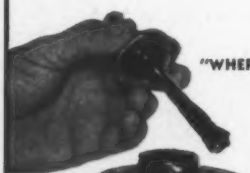


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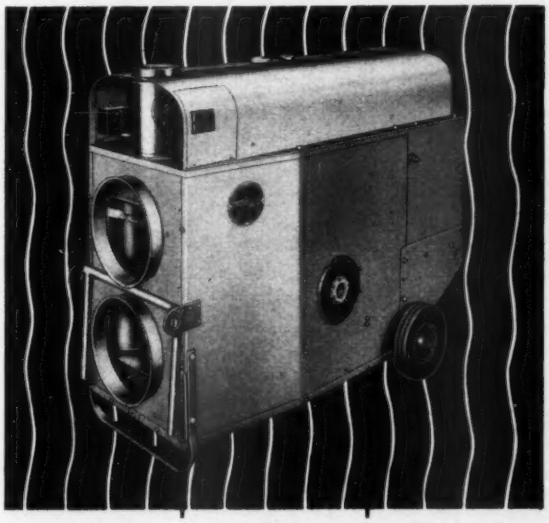

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# DATA FILE

(Begins on page 224)

designed for carrying air and other gases, many solids, and liquid at low pressure—are described in 8-pp Bulletin 10C-1. Applications are described, and performance data and specifications included. Flexible Tubing Corp.

**431** **Industrial Dust Control**—A wide variety of collection methods for industrial dust control is described in 16-pp Bulletin 922. A typical case history is included, as well as photos, cutaway views, drawings and capacity data on the various units. Pangborn Corp.

## FILTERING

**432** **Filters, Strainers** — Industrial Catalog 1054, 48 pp, provides application and engineering information on company's line of microfilters and precision strainers. Fuel filters, full flow and by-pass lube filters, air separators, and metal edge strainers for fuel lube and industrial use are presented along with construction details, performance data, and specifications. Purolator Products, Inc.

**433** **Filter Fabric Facts** — This 16-pp illustrated booklet contains information about filtration principles; filtering devices; filter media; textile fabrics for filtration; a comprehensive chart on chemical and heat resistance of cotton and synthetic fabrics; sections on yarns, fabrics construction and finishing; and a round-up of filter fabrics in use. Wellington Sears Co.

## INSTRUMENTS, CONTROLS

**434** **Service Regulators**—Revised Bulletin 1026, 20 pp, features company's line of service regulators. Rate-of-flow graphs illustrate mathematically the determination of maximum outlet pressure build-up and amount of gas relieved to atmosphere by extra safety device in case of failure of regulator. Rockwell Mfg. Co.

**435** **Versatile Electronics**—How flexibility of electronic temperature controls makes them useful in a wide range of heating and air conditioning installations is explained in this 16-pp booklet, Bulletin SA-2681. Purpose of publication is to fill the gap between the theory of electronic bridge circuits and specific control layouts and circuit diagrams. Four basic features that give electronic control its flexibility and broad application are described. Minneapolis-Honeywell Regulator Co.

**436** **For Industrial Metering**—Practical selection and application data on meters for industrial liquids are provided in 20-pp Form 566. Explains value of metering in batch mixing, process and cost control. Illustrated charts show how to select and proper meter according to type, temperature and flow rate of liquid to be metered, and include specifications for models shown. Strainers, valves and other accessories are described. Neptune Meter Co.

**437** **Thermal Controls** — Descriptive and basic technical data on company's Thermoswitch controls are presented in 16-pp condensed Catalog 500. Products listed include the following types of controls; standard line, differential expansion; liquid filled snap-action, midget and miniature differential expansion; indicating controllers, bulb and capillary, and electronic. Fenwal, Inc.

**438** **Combustion Controls**—Included in this catalog (about 16 pp) are product descriptions of company's combustion instruments and controls. Covers damper controls; drive units; draft, air pressure and flue temperature gages; steam controls; panel board cabinets; low-draft cut-off switches. Pages are fully illustrated to show design and operational details, and brief text includes application suggestions, special features. Cleveland Fuel Equipment Co.

**439** **Temperature Controls** — Eight-pp Catalog CC, on temperature controls and allied equipment for heating and refrigeration, provides information on recording, indicating, non-indicating controls; thermometers; bulb installation accessories; process timers, and gas pilots. Includes prices and references to detailed literature. The Partlow Corp.

**440** **Contour Projectors**—The use of projection or optical gaging with company's contour projectors is discussed in this illustrated bulletin. Points out chief advantages and describes typical applications. Specifications and dimensional diagrams for a number of models are included. Eastman Kodak Co.

## LUBRICATION

**441** **Lubricant Data Book**—The 16-pp current edition of this company's popular Lubriplate Data Book offers practical information on lubrication of machinery. Gives product data on grease type and fluid products, hydraulic oil, compressor oil, motor oil. Suggestions on applying lubricants under normal and special conditions are provided. Several pages are devoted to lubricant recommendations for equipment used in a variety of industries—bottling plants, chemical and food processing, metalworking, iron and steel plants, textile plants, woodworking, pulp and paper machinery. Lubriplate Div., Fiske Bros. Refining Co.

**442** **Lubricants—Specification, Classification** —Vital information on selection of lubricants is presented in 10-pp Vol. 41, No. 4 of "Lubrication." Covers such items as performance specifications, initial suitability of lubricants, quality of lubricant, effect of lubricant on production, effect on maintenance, effect on power, effect on cost, and features a look to the future. The Texas Co.

## FANS, VENTILATING

**443** **Industrial Fans**—Bulletin 702A features company's line of fan equipment for industrial air and material handling applications. Photos illustrate various types available, and complete descriptive detail and a table of general data are included. Clarage Fan Co.

**444** **Industrial Fans**—Propellair Bulletin 650, 12 pp, contains dimensions, application, and


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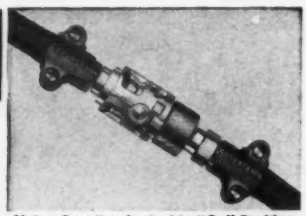

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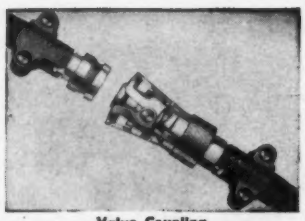
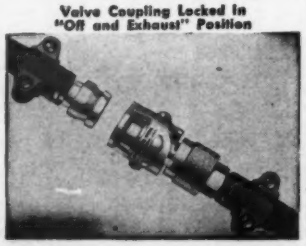


Valve Coupling Unlocked and Disconnected

Valve Coupling Locked in "Off and Exhaust" Position



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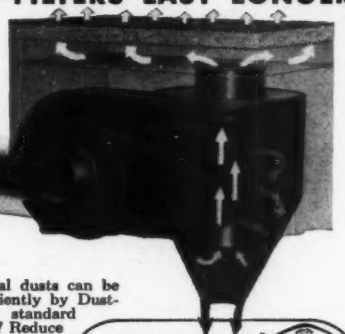

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# DATA FILE

(Begins on page 224)

performance data on Tubeaxial and Stackbooster fans. Gives information on cooling and drying problems, system and open surface tank ventilation. Robbins & Myers, Inc.

**445** **Roof Ventilators** — Sixteen-pp Bulletin A-112, revised, covers manufacturer's line of reversible roof ventilators, also penthouse Vertijet, rotary and other models. Sizes, specifications, performance data and dimensional drawings are included. Hartzell Propeller Fan Co.

## OTHER EQUIPMENT

**446** **After Cooler**—Bulletin 130, 8 pp, explains functions of company's Aero after cooler in removing moisture from compressed air and gas. The apparatus is described and illustrated with diagrams and photos. Included also are diagrams and illustrations of applications in liquefication systems. Niagara Blower Co.

**447** **Detergent Oils**—How to clean sludge out of hydraulic and lubrication system without shutting down machines is told in Technical Bulletin 44. Also tells how continued use of these highly detergent oils keeps equipment as clean as new. Sun Oil Co.

**448** **Equipment Selector Charts** — Bulletin CE-50, 20 pp, contains selector charts on corrosion-resistant equipment for process industries. Tables cover general considerations in selection of material, physical properties, corrosion resistance, techniques and skill in manufacture of equipment. Describes rubber and plastic pipe, tubing and fittings; valves; pumps; rubber-lined tanks. American Hard Rubber Co.

**449** **Ductile Iron** — Cast iron that can be bent is described in this 28-pp revised edition, with tables, charts and photos. Photos show applications of ductile iron castings, and bulletin lists typical applications in various industrial fields. The International Nickel Co., Inc.

**450** **Oilers and Safety Cans**—Catalog 55-C covers company's complete line of oilers and oil and gasoline containers. Photos and drawings, as well as specification data and prices are included, and replacement parts are identified and pictured. An attached analysis sheet furnishes descriptive data. Eagle Mfg. Co.

**451** **Abrasion, Corrosion Protection** — This 24-pp book illustrates how company's rubber faced steel plate reduces maintenance cost resulting from abrasion or corrosion. Shows case histories in a wide variety of industries. The Gates Rubber Co.

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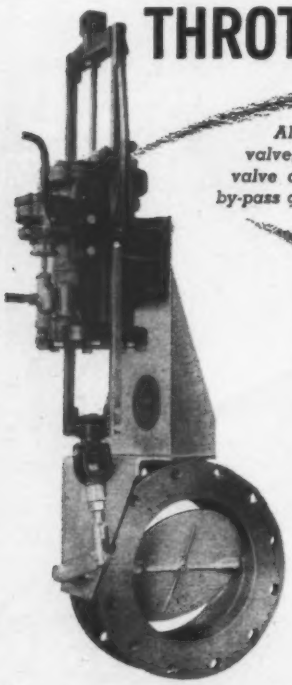
**452** **Corrosion-Proof Materials**—Bulletin CC-3, 16 pp, gives basic information on company's corrosion proof construction materials, covering chemical and physical data, estimating data and descriptions of products used for acid proof installations in the metal working, chemical, petroleum, pulp and paper and other industries. Included are sections on corrosion proof cements, tank linings, protective coatings, rigid plastic fabrications and rigid plastic pipe, plus a chart showing their resistance to chemicals. The Atlas Mineral Products Co.

**453** **Synthetic Fluids, Lubricants** — Form F-6500D, 52 pp, on synthetics, covers properties, applications, and characteristics of these poly-alkyline-glycol derivatives. Describes uses as mechanical lubricants, hydraulic fluids, rubber and textile lubricants, heat-transfer fluids, anti-foam agents, solvents, and formulation components. Engineering data is presented in the form of tables and charts, and application photos included. Carbide and Carbon Chemicals Co., Div., Union Carbide and Carbon Corp.

**454** **Air Conditioning Systems** — Summer and winter air conditioning systems for year-round comfort are illustrated and described in 24-pp Form L-115. Covers waterless condensing units, cooling coils, fan-coil units, water-cooled packaged air conditioners, gas and oil winter air conditioners, and individual room conditioners and other equipment. Capacity data, dimensions, and specifications are included, as well as photos and drawings. Airtemp Div., Chrysler Corp.

**455** **Swivel Joints**—Catalog G-4, 32 pp, covers this manufacturer's line of ball-bearing swivel joints as well as other products, including loading racks, manifolding lines, all-metal hose. In addition to providing dimensional and operating data on these products, this booklet is generously illustrated. Chiksan Co.


# THROTTLES HOT GASES



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# DATA FILE

(Begins on page 224)

**456** **Industrial Finishing Equipment**—Catalog A-657, 12 pp, describes a complete modern finishing system for cleaning, rust proofing, drying, painting and finish baking operations. Typical finishing systems handling a variety of products are pictured and details on how system can be designed to accommodate any product and meet any production requirement are furnished. The R. C. Mahon Co.

**457** **Incinerators** — "The Incinerator Blue Book" is a 16-pp bulletin on incinerator developments, covering design features, methods of feeding or charging of refuse, waste analysis, and other information. An incinerator selection chart, classification of incinerators, capacity and dimension data and incinerator specifications are included. Various types of disposals, medical waste crematories, custom incinerators, utility incinerators, heavy duty incinerators, and flue fed incinerators are pictured and described. Joseph Goder Inc.

**458** **Overheat Protection**—Bulletin MOPR-1, 8 pp, describes design and operation features of inherent overheat protectors—small devices built into electric motors to turn power off when windings get too hot. Includes photos and wiring diagrams illustrating operation. Metals & Controls Corp.

**459** **Television Equipment** — Twenty basic applications for "TV Eye" low-cost closed circuit television equipment are described and pictured in Form 3R2335. Folder explains equipment's functions and operation, lists specifications. Radio Corp. of America.

**460** **Preheating Combustion Air**—This well-illustrated 36-pp booklet explains fuel savings and increased performance made possible by using waste heat in flue gases to preheat incoming combustion air. Also covers increased boiler output. Air Preheater Corp.

**461** **Steel Reservoirs, Standpipes**—This 24-pp booklet pictures installation of reservoirs of 50,000- to 10,000,000-gal capacity, having cone, umbrella or ellipsoidal roofs and ornamental structures with special architectural features. Chicago Bridge & Iron Co.

**462** **Protective Clothing**—Catalog 12000, 12 pp, describes and illustrates company's line of industrial clothing for protection against water, fire, acids and alkalis, slipping and scuffing. Various types of work gloves and suits and coats are featured, and protective features and advantages of this equipment are pointed out. The B. F. Goodrich Co.

**463** **Glassed Steel Reactors** — Bulletin 927, 8 pp, describes glassed steel reactors for processing a wide variety of products under diverse conditions, stressing their versatility as to corrosion resistance, agitation, and temperature-pressure range. Standard specifications are tabulated and dimensional diagrams are included. The Pfaudler Co.

**464** **Neoprene Design Book**—This illustrated bulletin discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness, hardness range, air retention, performance under load, at extreme temperatures, flame and chemical resistance. Elastomers Div., E. I. du Pont de Nemours & Co.

**465** **Mechanical Seals** — Bulletin AD-150, 8 pp, features complete data on Type BB-21A Mechanipak seal. Tells how it works and illustrates operation and design features with cutaway drawings. Typical applications are listed and specifications are tabulated. The Garlock Packing Co.

**466** **Improved Machine Mounts**—This brochure describes advantages of company's leveling machine mounts. Tells how they enable installation and leveling of heavy machines without bolting or shims, afford increased machine mobility, reduce maintenance costs, and lessen noise. Barry Controls, Inc.

**467** **Spray Painting**—Advantages of an electrostatic spray painting process are discussed in this 16-pp bulletin which contains diagrams of both the disk atomizer and bell-shaped atomizer. Production line examples show applications in the finishing of industrial products ranging in size from automobile chassis to door knobs. Technical laboratories where a variety of conveyors are available for testing of electrostatic spray painting are also shown. Ransburg Electro-Coating Corp.

**468** **Belt Fasteners** — Bulletin F-112A describes belt fasteners designed to join conveyor and elevator belts in every width. Also covers rip plates for repairing jagged rips and tears, scraper plates and applications tools. Contains photos showing installation, selection data, list prices. Flexible Steel Lacing Co.

**469** **Teflon Products** — Three bulletins present this company's Teflon packings, gaskets, special parts and stock. Bulletin CP552 describes Chempro lines of Teflon ring packing. Teflon impregnated asbestos packing. V-type packing, and Teflon seal cage—for use with acids and strong chemicals. Bulletin CP553 covers Teflon jacket gaskets, solid ring gaskets, expansion joints and special gaskets. Bulletin CP554 illustrates special parts. Chemical & Power Products, Inc.

**470** **Magnetic Selection Guide** — Twelve-pp illustrated Catalog C-5000-B, describing manufacturer's entire line of magnetic separators and lifting magnets, serve as handy guide to selection. Dings Magnetic Separator Co.

On pages 219-220 are two postage-free Reader Service Cards provided for your convenience in ordering these catalogs. You may also use the cards to order any literature mentioned in ads.


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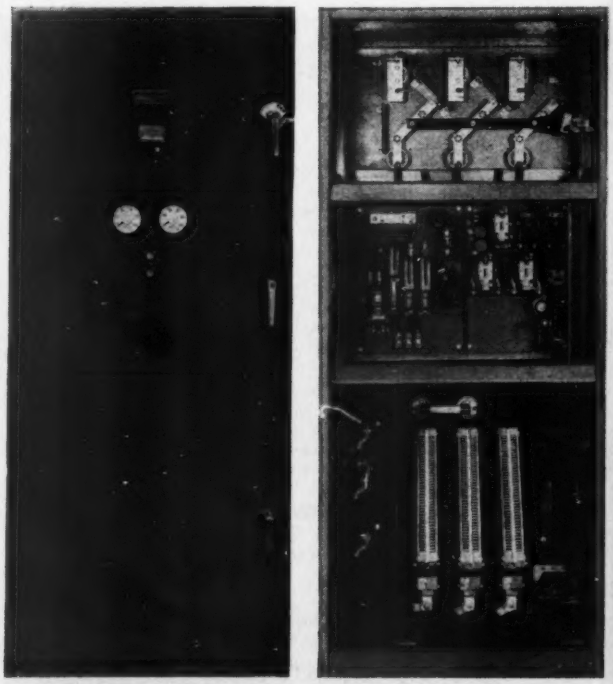

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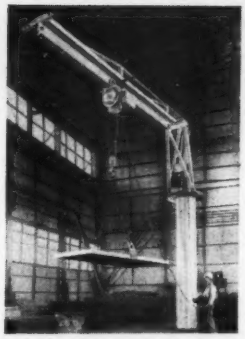

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TESTING AND TROUBLESHOOTING procedures presented in step-by-step form have been field tested by men concerned with installation and maintenance of electrical equipment. Methods of testing and fault-finding cover controllers, motors, transformers and transmission lines.

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Most of the tests in the book make use of dry cells or residual magnetism so that accidental contact or short circuits are less hazardous for both man and machine.

### On Industrial Engineering

**INDUSTRIAL ENGINEERING HANDBOOK edited by Harold B. Maynard. Size 9¼ by 6½ in.; 1504 pp; illustrated; cloth bound. Published by McGraw-Hill Book Company, Inc., 330 West 42nd St., New York 36, N. Y. Price $17.50.**

EIGHTY-ONE AUTHORS have contributed material to this book on such diverse principal topics as work measurement, wage payment, plant facilities and design, control procedures and predetermined-elemental time standards. It is a comprehensive treatment of industrial engineering.

The book not only includes material on long accepted techniques of time and motion but also covers such developments as automation and linear programming. Procedures used directly by the industrial engineer and such related subjects as quality control, and tool and gage design are treated. Human and industrial relations of industrial engineering are stressed in the book.

### Industrial Productivity

**DYNAMIC FACTORS in Industrial Productivity by Seymour Melman. Size 8¾ by 5¾; 238 pp including index; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $4.75.**

STUDIES OF COSTS and practices principally pertain to industrial activities in England. However, some consideration has been given to costs in the United States. England was selected for these studies because conditions offered a good opportunity to observe differences in production performance enhanced by increased mechanization of materials handling since World War II.

The book is divided into four main sections. The first part deals with the effect of changes and modernization in materials handling on productivity. Some of the other items that this section includes are: alternative costs in

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## Building Vents for Pressures

**PRESSURES DEVELOPED BY RAPID COMBUSTION. Size 11 by 8-7/16 in.; 19 pp; illustrated; paper bound. Published by Factory Mutual Engineering Division, 1151 Boston-Turnpike, Norwood, Massachusetts. Price $1.00.**

THIS REPORT PERTAINS to investigations to determine the effects of rapid combustion inside buildings. In it is offered a simplified version of a complex formula developed by Dr. H. Jones, a British scientist, for dust explosions. This simplified formula in which equilibrium pressure is used applies to the determination of building vent sizes to prevent wall blowout.

## Welding

**RESISTANCE WELDING THEORY AND USE. Size 9-3/16 by 6-3/16 in.; 163 pp including index; illustrated; cloth bound. Published by Reinhold Publishing Corporation, 430 Park Ave., New York 22, N. Y. Price $4.50.**

ALL SIX RESISTANCE welding processes are described briefly in this book prepared by the Resistance Welding Committee of the American Welding Society. These are known as spot, seam, projection, flash, upset and percussion welding. A separate section is included in the book on the various types of machines used in making different kinds of welds.

Welding terminology and basic principles, controls, electrode maintenance and the electrical system in welding are some of the subjects covered in this handy manual. In the section on inspection and testing there is information on types of tests, preparation for testing, methods, evaluation of weld consistency, and control of weld quality.

## Electrical Equipment

**FACTORY ELECTRIFICATION by F. T. Bartho and C. H. Pike. Size 8¾ by 5⅝ in.; 398 pp including index; illustrated; cloth bound. Published by the Philosophical Library, Inc. 15 East 40th St., New York 16, N. Y. Price $12.00.**

THIS BOOK SHOULD be of value to plant engineers and those engineers concerned with the maintenance and installation of electrical equipment. The work is of English origin but ideas and principles presented in the book are applicable to American practice.

The overall treatment of the subject of plant electrification is essentially a practical one. It deals with the general requirements in installation, distribution, cable and wiring systems. Various types of a-c and d-c motors are also covered.

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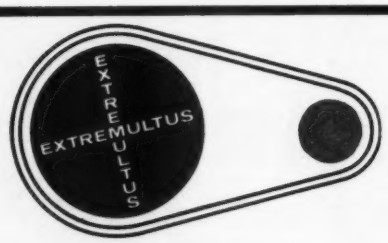


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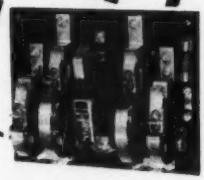

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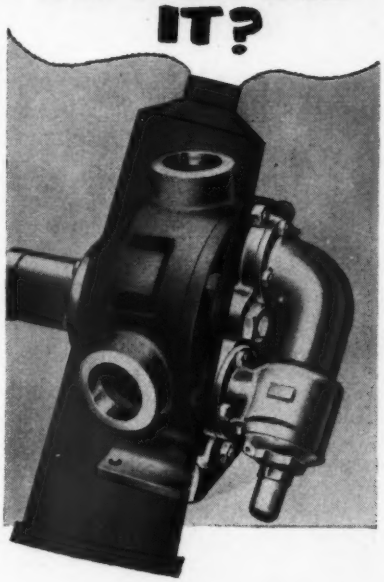

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# 7 REASONS WHY

## Hartzell Vaneaxial Blowers

- LAST LONGER
- DO A BETTER JOB

Belt-drive model (shown) available in sizes from 12" to 54", standard or high-temperature construction. Also available in direct-drive models, 18" to 42". These blowers operate efficiently against pressures as high as 10", deliver up to 87,000 CFM. For complete details, write for Bulletin A-110 or call your nearby Hartzell field engineer.

- Heavier gauge steel throughout — outer shell steel ranges from 14 gauge on 12" models to ¼" plate on 54" models — to evaluate strength of construction, compare net weights before you buy.
- Precision-cast, aluminum alloy impeller, dynamically balanced to prevent vibration.
- All-welded construction — guide vanes are welded to both inner and outer shells — there's nothing to work loose and vibrate.
- Certified ratings—all Hartzell blowers are tested for air deliveries according to the Standard Test Code.
- Easy maintenance—ball bearing pillow blocks are Alemite lubricated from outside the duct section — belts can be changed by removing one small plate.
- Belts totally enclosed to prevent damage by elements in the air stream . . . yet easily adjusted by turning two bolts.
- Top quality motors supplied by nationally recognized manufacturers.

**Why You Can Count on Hartzell Air-Moving Equipment for Long Life, Rugged Reliability and Minimum Maintenance**

Hartzell fans and blowers are engineered and built for the exacting requirements of tough industrial service. There's no compromise with quality for the sake of shaving a few dollars on price. Hartzell fans are designed for the industrial buyer who is willing to pay for long life, dependable service and low maintenance.

# HARTZELL
## PROPELLER FAN CO.

Div. of Castle Hills Corp.

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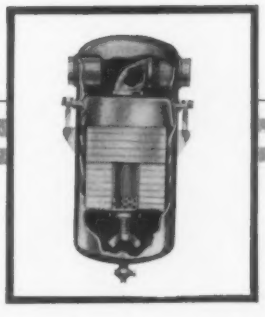
# KEEP IT CLEAN... by Phil Tration



Filtering "sound and fury," as shown in the cartoon, is what Walt Disney would call a *plausible impossible* use for Dollinger Filters. In industry today, however, practically any gas, liquid, or air *can* be handled more efficiently with Staynew Filters. They protect machines or processes, or workers from the damage caused by dust, dirt, oil, grease, or other foreign matter. In thousands of industrial and ventilating applications throughout the world, Staynew Filters have become recognized as the highest standard of quality available.

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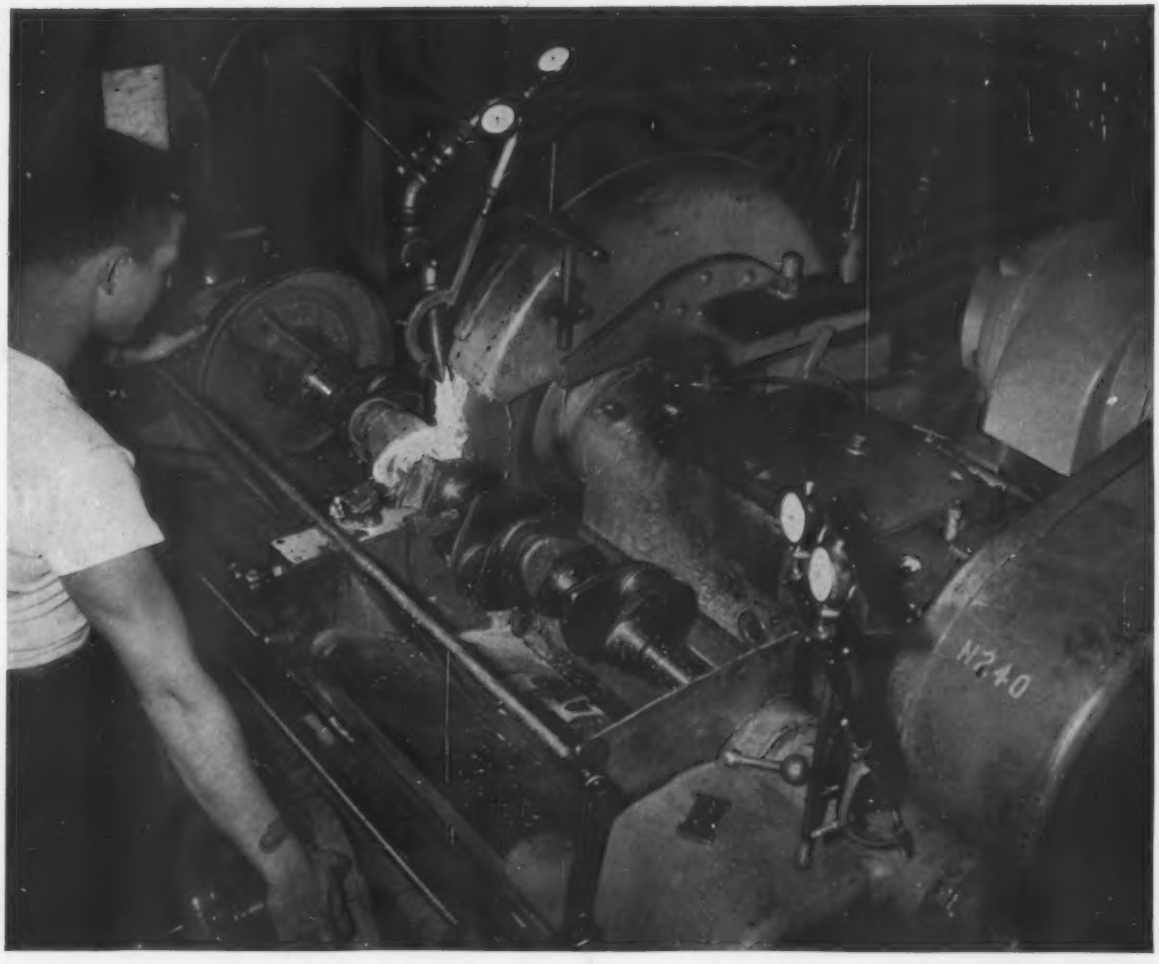

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MANY machining operations, particularly grinding, are performed with soluble oil emulsions as coolant. Unless the soluble oil contains an effective rust inhibitor, the finished parts will rust. This can harm such precision parts as ball and roller bearings, crankshafts, cylinders, etc. In any case, removal of rust means extra work and extra cost.

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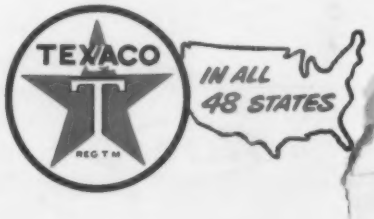
The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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